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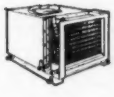

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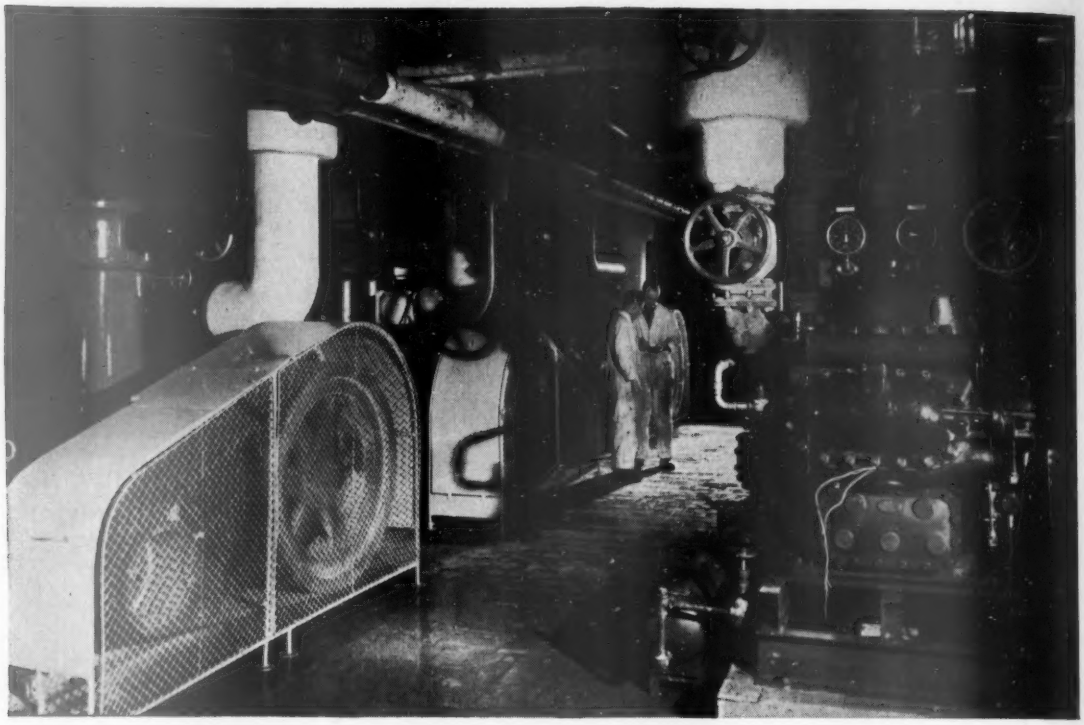

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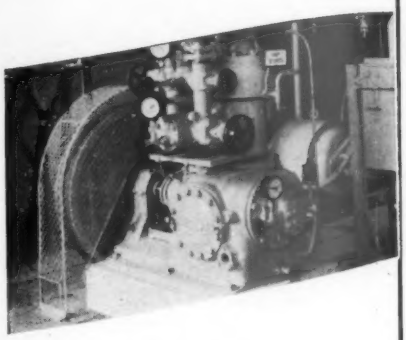
Established 1898

Contents

Editorial	566
Book Reviews	567
News of the Month	568
Picture of the Month	569
Refrigeration in the Field of Transportation	570
An Environmental Chamber	575
A Photographic Eye at the "Expo"	582
New Cold Stores for Hay's Wharf	586
Refrigeration Controls—6	592
Institute of Refrigeration Bulletin	599
Commercial and Industrial Section	604
Refrigeration in Ceylon	611
Shop Refrigeration News	613
Storage of Salk Vaccine	627
International News	628



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MODERN REFRIGERATION *overseas*

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VOLUME 61 NUMBER 723

June . 1958

Editorial . . . .

Q.-F. Operator in Fighting Mood

Refrigeration in India

Milk in Blocks

● Both the cold storage industry and refrigerated cabinet makers came in for some rough treatment at the hands of the president of The National Association of Wholesale Distributors of Frozen Foods, at their spring luncheon last month, which was attended by the trade press rather unfortunately in the circumstances. Mr. N. O. Quibell saw fit to castigate, in his own inimitable style, cold storage operators for the rates they charge, hinting that the monopolies commission might be interested in this industry. This surely was ingratitude indeed, seeing that the cold storage trade has invested hundreds of thousands of pounds in meeting the needs of this very expensive and specialized business and, to our knowledge, has met these demands very satisfactorily. Naturally, the rates are not low in a trade that seeks temperatures down to –20° F., and requires service inside the chambers such as breaking and sorting of packs. Those distributors who operate their own stores on anything like a commercial basis must know that this is a trade that maintains food in its very best possible condition and that it can never be a cheap one. It would seem that N.A.W.D.O.F.F. and the N.F.C.S.I.T. should confer more often. Mr. Quibell maintained that Continental storage charges are very much lower.

● As for the assertion that display cabinet makers are not meeting the needs of the frozen food trade, it is strange that retailers (who, after all, are the users concerned) have raised so few complaints ; indeed, in the last 12 months business has soared and to-day's modern refrigerated cabinet is doing a terrific selling job. But perhaps we see more of the retail side of the trade, up and down the country, than does Mr. Quibell. Or could it be that some suppliers have sold the retailers some frozen food lines that have not moved very quickly, and retailers have blamed the cabinet ? One charge made by Mr. Quibell was that an advertised 12-c.ft. cabinet, if not loaded above the " plimsoll " line, and if kept at 5° F. was, in fact, of only 8 c.ft. capacity. To which we would reply that this is immaterial when seen against the question of whether the cabinet is loaded with wasteful-of-space sponge cakes or, at the other end of the scale, neat 5-oz. packages. However, surely these matters could have been thrashed out with the parties concerned.

● The lot of the refrigerator importer in India is indeed a dire one and has become progressively sterner since October, 1957, at which date a total ban on domestic refrigerators became operative. According to the ninth annual report of the Refrigeration and Air-Conditioning Trades Association Limited, whose hon. secretary, Mr. H. K. Ghose, has kindly sent us a copy, however much this policy might be justified by the Government on the grounds of shortage of foreign exchange, it has dealt a mortal blow to members of the trade dealing solely in domestic equipment. Despite strong representations, a total ban on the import of all categories of refrigeration and air-conditioning equipment is now effective for the licensing period, April to September, 1958. In view of the seriousness of India's food situation, the authorities would be well advised to heed the warning of experts that importation of vital refrigeration plant should be one of the corner stones of that country's five-year plan.

● The development of frozen milk which is palatable on thawing has involved a great deal of research. A Southampton company, Brown & Harrison's Dairies Ltd., is now producing milk frozen solid in brick-shaped blocks in an effort to encourage sales in tropical countries where climatic conditions are adverse to safe, fresh milk. Its flavour is very close to that of the product in its natural state. The blocks, measuring 18 in. long, 10 in. wide and 4 in. deep, are not unlike country butter in appearance. They are the result of experiments and research carried out over the past three years at the firm's Eastleigh processing plant and in their Southampton laboratory. The company's aim was to supply a product which would be used by ships and airliners on long journeys.

● Sealed in transparent plastic bags, the freshly homogenized pasteurised full-cream milk is frozen into easily packed blocks which save a considerable amount of space needed for milk packed in more traditional containers. A new refrigeration room is now being installed at Eastleigh, and when it is completed it is estimated that the full freezing process will take about 24 hours. According to the company's manager at Eastleigh, Mr. T. C. Pickford, production methods are still in the experimental stage, and some changes in refrigeration methods may be adopted in the light of experience.

● When thawed, even after many weeks in cold storage, the milk is exactly similar to fresh milk in both taste and texture. The Eastleigh plant is claimed to be the only one of its kind in the south. Good results are already being reported from the use of the frozen milk in liners sailing from Southampton, London, Liverpool and Avonmouth. The company has also received inquiries from oil companies with connexions in the Middle East and Persian Gulf regions, and also from West Africa. Other concerns interested include several airline companies and trawler-operators of Grimsby and Lowestoft.

● Partial success of a £100,000 scheme initiated by a group representing a cross-section of the Aberdeen fishing industry to establish quick-freezing and cold storage facilities in that city was announced last month. The original intention of the group was to set up a cold store with a capacity of 1,000 tons and capable of being extended to 1,500 tons, based on assistance from the White Fish Authority. It was found, however, that because of the differences between English and Scottish law, the authority could give a loan of only 50 per cent. whereas in England it would have been 80 per cent. The law of Scotland does not acknowledge movables as securities and here the authority can only advance loans on permanent buildings. Mr. Byron S. Bellamy, an Aberdeen fish merchant and one of the promoters of the scheme, said the capacity to be provided would be reduced from 1,000 to 625 tons. It would, however, provide the finest and most modern conditions for quick-freezing and storing fish.

● A number of British seaside towns will have a new service to offer holiday makers this year. For 6d. in the slot they will be able to get a carton of " ice cold " pasteurized milk from a specially refrigerated machine. At least 1,000 of these machines are expected to be installed throughout the country by the end of the year. Inland towns will also have these machines—one favourite site will be railway stations where the thirsty traveller will be able to get a long, cool drink in a matter of seconds, writes DoRDec. The Milk Board say that people drink more milk if it is served really cool, around 42° F. Manufacturers of refrigerators have taken this into account in designing the 1958 models and most of these have special door shelves to provide easily accessible storage space for milk bottles.

Tailpiece

● The demand for household refrigerators is surging ahead. Retailers and electricity boards throughout the country are reporting unprecedented sales. Unable to wait until they reach the shops some impatient " customers " have decided to take matters into their own hands. Last month a van load of 63 Frigidaire 3-c.ft. cabinets was parked overnight at Stamford during transit from the Frigidaire factory at Kingsbury, N.W.9, to the north of England. The next morning both van and cabinets had disappeared. Despite a cold trail Scotland Yard's flying squad was soon hot on the track of the missing load and within a matter of hours it had been recovered—150 miles from its last resting place. Pending investigation several men were remanded.

Book Reviews

Handbuch der Kaeltetechnik. Vol. VIII : Erzeugung Sehr Tiefer Temperaturen. (Handbook of Refrigeration. Vol. VIII : Production of Very Low Temperatures.) By Prof. Dr. Ing. HELMUTH HAUSEN. 9¾ in. × 6½ in. xii + 412 pp. including 307 illustrations. 1957. Springer-Verlag, Berlin, Gottingen and Heidelberg. DM. 72 (DM. 57.60).

This is volume VIII of the handbook series under the general editorship of Professor Plank ; to subscribers to the whole series the reduced price of DM. 57.60 applies.

The book deals with the production and application of temperatures lower than those attainable by multi-stage compression or absorption machines down to the vicinity of the absolute zero of temperature. The opening chapters examine the fundamental principles of gas liquefaction and separation of gas mixtures at very low temperatures, rectification and heat exchange. The highly developed industrial very low temperature technique is fully expounded with particular attention to the zone between the absolute zero and 20° K. Compression, expansion, filtering and drying are dealt with, and the construction of the highly developed equipment for very low temperatures.

Chapters are devoted to operation, costs and transport of the end-products, to the properties of the liquid and solid gases at very low temperatures, and to their applications in all phases.

This authoritative work is the result of 28 years' industrial experience in addition to academic life.

Kaeltetechnik. (Refrigeration.) By Prof. Dr. Ing. e.h. MATTS BAECKSTROM. Translated into German by Dr. Ing. EDUARD EMBLIK. 8¼ in. × 5¾ in. xvi + 656 pp., including 373 illustrations and with nine charts in pocket. 1957. VERLAG G. BRAUN, Karlsruhe. DM. 56.

This is a second revised edition of the theoretical and practical work of the Refrigeration Professor at the Royal Technical College in Stockholm, again translated into German ; the first edition appeared in 1953.

In this second edition further information is given for " F-22," and the chapter on heat transfer has been improved. Some of the more useful diagrams are given in larger scale and on transparent paper loose in pocket of cover. Some corrections to tables have been made particularly to those of properties of refrigerants, mainly following R. Plank's " Handbuch der Kaltetechnik."

NEWS OF THE MONTH

Refrigeration and A-c. Exports.—During April, 1958, air-conditioning and refrigerating machinery (commercial and industrial sizes) to the value of £778,973, weighing 1,260 tons, was exported from the United Kingdom. Comparable figures for April, 1957, were 1,252 tons, worth £833,411.

* * *

Exports' Analysis.—Of the 1,260 tons of air-conditioning and refrigerating plant worth £778,973 exported by Great Britain in April, 1958—quoted in the preceding paragraph—53 tons went to the Union of South Africa, 44 tons to India, 254 tons to Australia, 73 tons to New Zealand, 36 tons to Canada, 228 tons to "other Commonwealth countries," 56 tons to Eire, 23 tons to Sweden, 22 tons to Western Germany, 62 tons to the Netherlands, 39 tons to Belgium, 29 tons to France, 56 tons to Italy, and 285 tons to "other foreign countries."

* * *

Refrigeration Plant Classified.—Of the total exports of air-conditioning and refrigerating machinery during April, quoted in the first paragraph, commercial refrigerators accounted for 140 tons, worth £81,382, industrial plant and equipment for 254 tons worth £140,083, and parts for all non-automatic power-operated machinery, including parts, for 398 tons, worth £319,668.

* * *

Exports of Small Refrigerators.—During April, 1,394 tons of complete refrigerators (domestic) (including complete mechanical units) were sent overseas from Great Britain. These exports were worth £829,205. The 1,394 tons comprised 89 tons to the Union of South Africa, 13 tons to Rhodesia and Nyasaland, 4 tons to India, 68 tons to New Zealand, 604 tons to "other Commonwealth countries," 19 tons to Sweden, 49 tons to Western Germany, 34 tons to the Netherlands, 122 tons to Belgium, 70 tons to Italy, and 322 tons to "other foreign countries."

* * *

Twenty-four-hour Milk Service.—In addition to its financial support of the National Milk Publicity Council's advertising campaign, the Express Dairy Company is determined to do all it can within its own organization to increase the sales of milk. After a considerable amount of research with machinery manufacturers a satisfactory refrigerated vending machine has now been perfected and nearly 100 of these are already installed at special sites all over the Greater London area. This 24-hour-a-day milk service is well supported by the public and the company is proposing to extend the service wherever possible.

* * *

Chemical and Petroleum Show.—Britain's first Chemical and Petroleum Engineering Exhibition, sponsored by the British Chemical Plant Manufacturers' Association and the Council of British Manufacturers of Petroleum Equipment, will be held at Olympia from June 18 to 28, and its importance and scope are already clearly determined. No fewer than 250 exhibitor manufacturers have booked stands, and their exhibits already amount to 125,000 sq. ft.—occupying the whole of Olympia's two largest halls and galleries. Proof of the tremendous development of these industries in Britain, and of the wide scope of the exhibition, is the fact that plant, equipment and ancillary services offered by the exhibitors will cover nearly 1,000 product classifications. During the exhibition, The Institution of Chemical Engineers, in conjunction with The Institute of Petroleum, will stage a symposium.

* * *

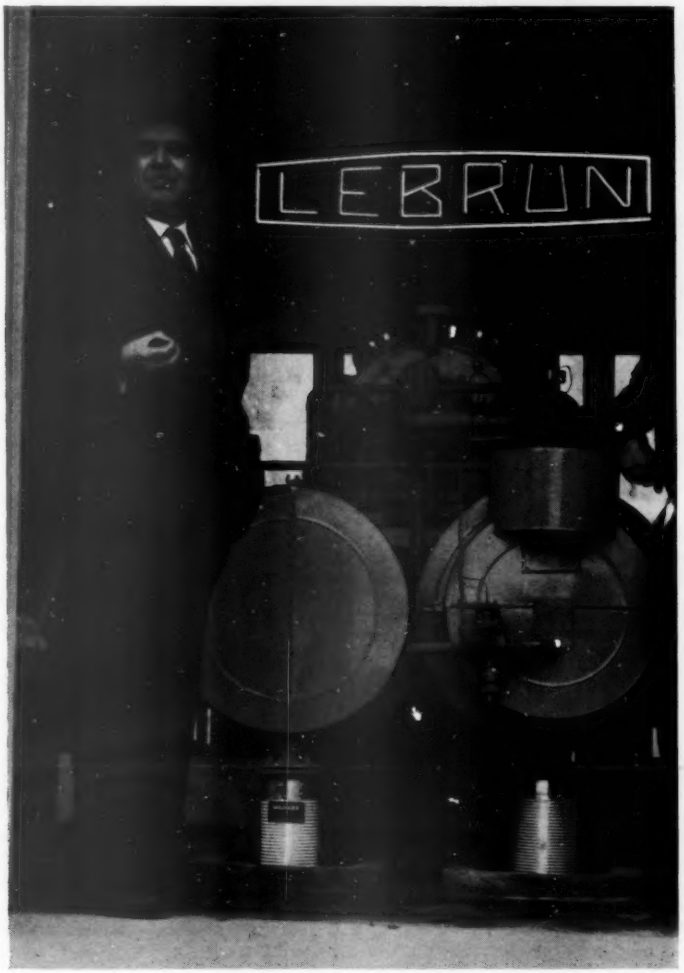
Large Freezer Depot.—The largest of Wall's 107 ice-cream supply depots throughout Britain was opened last month at Stonebridge Park, on the North Circular Road, West London, by the Mayor of Ealing (Alderman George Ward.) Introducing the mayor, Mr. J. D. O. Knowles, chairman of

T. Wall & Sons (Ice Cream) Ltd., of London, Manchester and Edinburgh, said the new depot was equipped to stock some 50,000 gallons of ice cream and would serve the districts of Ealing, Brentford, Hammersmith, Harrow, Hounslow, Paddington, Uxbridge, Wembley and Willesden, and London Airport. The population of the area was 1,639,041. Thirty vans will be based at this depot which will have a staff of about 60 at the peak of the summer. The depot has a working area of nearly 17,000 sq. ft. and holds a temperature of 42° to 47° below freezing. In the large thermostatically controlled wafer store, the temperature is held constant at 50° F., regardless of the weather outside. Mechanical conveyors, electrically operated, permit the ice-cream containers to be stacked and then off-loaded into the vans faster than ever before and with the minimum of labour in the refrigerated area. The design of the depot as a whole—by Mr. J. Kennedy Hawkes, F.R.I.B.A. —presented some interesting engineering problems. It stands on the bed where the River Brent flowed before diversion and piles had to be sunk 40 ft. into the alluvial soil to secure firm foundation. Principal contractors for the building and equipment were Leslie & Co. Ltd., of Kensington ; The Lightfoot Refrigeration Co. Ltd., of Wembley ; and the " J. D." Insulating Co. Ltd., of Liverpool.

Picture of the Month

★

. . . in fact, the " Man of the Month." Monsieur Roger Malengret Lebrun, chairman of S.A. des Ateliers B. Lebrun and of other associated companies, was photographed last month by "M.R." outside the refrigerating machine hall housing his plant which air-conditions the Atomium at the Brussels Exhibition (see also p. 582). Monsieur Lebrun had just been elected president of the Committee of European Manufacturers of Refrigeration Equipment concerned with refrigeration matters in the European Common Market. He is president of the Union Belge Frigoriste and vice-president of the Association Belge du Froid.



Refrigeration in the Field of Transportation

1. AUTOMOBILE AIR-CONDITIONING
2. SPANISH FRUIT WAGONS
3. INTERFRIGO VANS
4. ICE CREAM CARRIERS
5. NEW VEHICLE FOR GHANA
6. SHIPBOARD COMFORT COOLING

1—Automobile Air-conditioning

AN ADDITIONAL " LINING " TO THE SILVER CLOUD

Eighteen months ago Rolls-Royce and Bentley announced the availability of refrigeration for their export cars : since that date continued study has been made of the requirements. Existing American systems, except for certain examples made in Texas, were found to be inadequate in capacity. Either they produced insufficient temperature drop, or took much too long about it—mainly both. Rolls-Royce describe their new system, which has an airflow capacity of 400 c.ft. min., as being equivalent in cooling to about 50 ordinary domestic-type refrigerators.

A REFRIGERATION unit for cooling internal air gives complete air-conditioning on Rolls-Royce and Bentley cars. This optional extra is now available on the home market as well as overseas, and it will appeal particularly to owners* who take their cars on the Continent.

The high cruising speeds of to-day make it almost essential to keep the windows of cars closed at all times. Wind buffeting and draughts when the windows are open can make for discomfort and to keep the interior of the car at tolerable temperatures in all weathers, seasons and climates, the saloon body must not only be adequately ventilated, but mist and ice formation on the windows must be avoided.

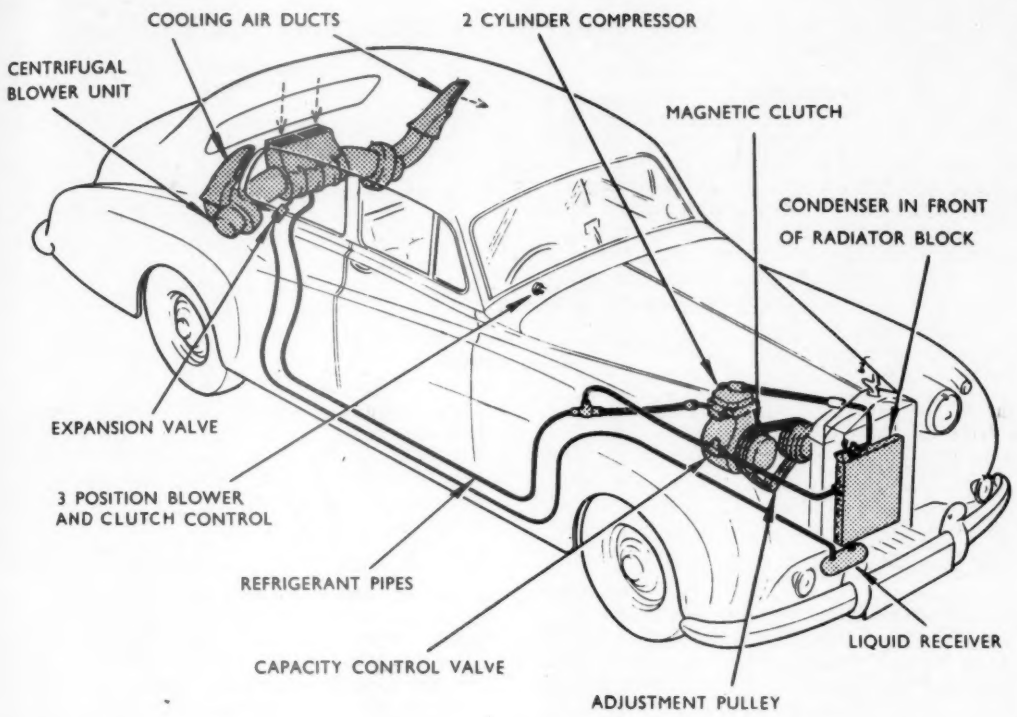
It is not enough to achieve a uniform temperature inside the car, regardless of outside conditions, as too great a differential between internal and external temperatures could produce a thermal shock, causing considerable discomfort and even nausea.

The " S " series cars introduced a change from the previous types in that they were fitted with a fresh air heating system and a ventilation system which is adequate for all normal purposes and is sufficient to keep all windows clear of mist even under heavy rain conditions with four occupants.

However, in really hot sunny conditions, this system is not capable of keeping the car sufficiently cool with all windows closed. Interior temperatures approaching 130° F. can be reached when the car is standing out in the open when the sun is high. Therefore, it has been found necessary to introduce a refrigeration system.

It is more difficult to cool a car than to warm it. For instance, the engine radiates heat through the bulkhead, the exhaust warms the floor and the people inside the car warm the air. If there is any sunshine even on the coldest day the infra-red rays coming through the glass of the windows tend to warm the people inside, so that when the car is running there is a natural tendency for it to become warmer. The size of the car heater which would otherwise be required is therefore reduced, but conversely the cooling of the car is made more difficult. Thus, because the refrigeration system has to combat the natural tendency, it has to be of very large capacity. Roughly speaking, the

*The cost is £385, plus £192 10s. tax on the Rolls-Royce Silver Cloud and Bentley " S " series, and £550, plus £275, on the coachbuilt cars.



capacity of the refrigerator system in the car is equivalent to 50 domestic type refrigerator cabinets. In refrigeration terms the car unit is 2 to 3 tons. A "Freon" two-cylinder compressor is fitted, actuated by a magnetic clutch.

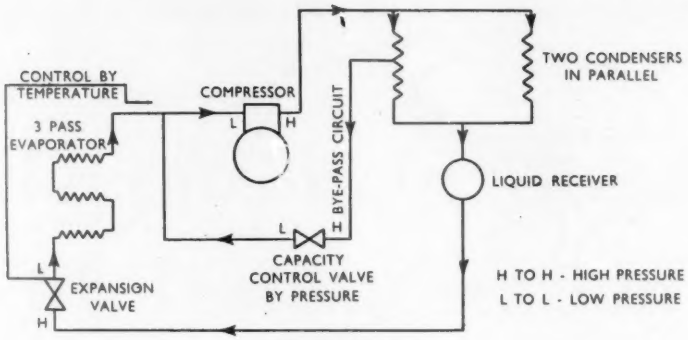
Apart from the natural tendency of the car to warm up, there is available a supply of energy to use for heating the car, *viz.* the heat in the engine coolant which is otherwise waste heat, but there is no such thing as waste "coolth" for the refrigerator, so the energy to cool the car has to be absorbed from the engine. This can amount to 3 or 4 b.p.h. under cruising conditions in hot weather.

To help the refrigeration system, the car roof is insulated which helps to reduce the heat input from solar radiation. Other aids are more extensive heat shields between the exhaust system and the underneath of the car floors. External visors and special heat-absorbing glass in the windows are extras available for the same purpose.

The condenser unit is fitted in front of the radiator where there is a good supply of fresh, relatively cool air, and the engine coolant is kept under pressure to give a greater margin before boiling can occur. The evaporator unit is neatly installed at the back of the boot.

One of the difficulties about car refrigeration is that it is most needed when the car is travelling slowly or after it has been left standing in the sun, when the inside is like an oven, and the occupants desire to cool the interior as quickly as possible. Therefore, the refrigerator system needs excess capacity to meet this demand, but afterwards, when the car has been cooled to the required temperature which is about 20° to 30° F. below the shade temperature outside, according to the climate, the excess capacity has to be dispersed. Hence the system needs an automatic control in addition to the user control. This has been achieved by taking some of the partially condensed gas from part way down the condenser and passing it through a control valve into the pipe line between the evaporator and the compressor, so that the compressor draws some of its charge from the evaporator and some through the control valve. The control valve opens when the suction side of the compressor reaches a predetermined minimum, and by this means the evaporator is never allowed to become too cool. The driver controls the amount of cooling simply by altering the speed of the air blowers. In this Rolls-Royce system air flow capacity is 400 c.ft. per minute.

In parts of America, it seems, the law permits



CIRCUIT DIAGRAM

a car to be left parked with the engine running. To drive the refrigeration unit, Rolls-Royce and Bentley cars are provided with a fast idling speed of 900–1,000 r.p.m. The cars can be left safely without fear of overheating for a shopping session or business call, and the car interior is then cool on the owner's return.

Two Smiths' electric centrifugal blowers draw the warm air through a central grille, behind the back seat, directly into the evaporator and expel it again through two circular jets at the extreme edges of the shelf behind the back seat.

High and low pressure pipes between the front and rear group of units in the system are of particularly interesting construction. They are, in fact, concentric, the high-pressure copper tube being inside and the Neoprene-lined, natural rubber pipe surrounding it. Thus the pipe takes the form of a heat exchanger. It has been specially developed by Dunlop. The evaporator is compact, and beautifully made in aluminium with brazed joints by Marston Excelsior Ltd.

The big cooling capacity needed to reduce temperature in a hot car quickly is excessive for normal demands, and so part of the capacity may be dispensed with in cruising conditions. Therefore in addition to the driver's control on the instrument panel, which simply gives three fan speeds, there is an automatic device. This takes the form of a capacity control valve which allows some of the partially condensed gas taken from a point half-way down the condenser, to be fed back into the return pipeline just before the entry to the compressor, as mentioned earlier.

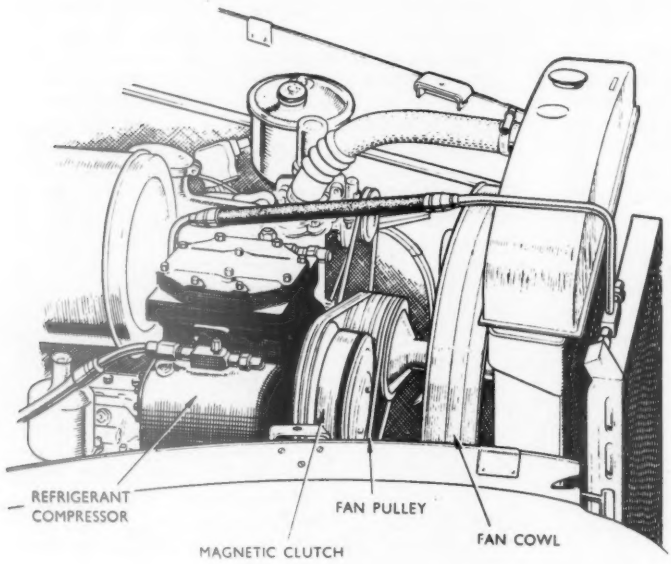


Diagram illustrating position of compressor and condenser and showing details of compressor drive.

2—Overland Transport from Spain

DEVELOPMENT OF TRAFFIC IN WAGONS WITH INTERCHANGEABLE AXLES

ONE of the most remarkable features of post-war Europe has been the tremendous increase in the transport of perishables. The reasons for this development are readily apparent : the higher standard of living in most European countries has opened up new markets not only for foodstuffs which may be regarded as necessities, but also for luxury goods such as bananas, fresh fruits and early vegetables ; at the same time, there has been a parallel improvement in agricultural techniques leading to greater productivity and, finally, the progressive liberation in the exchange of currencies has facilitated the international exchange of products.

The producer countries have of necessity been forced to export their goods in order to achieve a balance of payments and, at the same time, the demand for those foodstuffs has grown in the consumer countries.

Speed is the essential factor in the transport of fruit and vegetables to ensure that they reach the consumer in perfect condition, and it is for this reason that the railways have been the principal carriers of these traffics, the rapid increase in which has given rise to many problems. It is to the credit of the railways of Europe that they have successfully met the challenge by providing improved rolling stock fulfilling the technical requirements, by introducing speedy transits, by standardizing packing and containers, by improving precooling and icing techniques and by providing improved facilities at dispatch and destination points for the handling of the goods.

Foremost among the producer countries of fruit and vegetables is Spain, but until the year 1951 rail traffic between Spain and the rest of Europe was impeded by the difference in gauge, which necessitated transhipment from Spanish to European wagons at the Franco-Spanish frontier, with all its attendant evils—loss of speed, handling charges, pilferage, deterioration of the goods, immobilization of the wagons, more costly packing.

A Spanish limited liability company, " Transfesa," found the solution and on January 24, 1951, it inaugurated at Hendaye an installation for the changing of axles, followed on May 15, 1951, by an identical installation at Cerbere. Each installation consists of two groups of four gantries which permit two wagons to be handled simultaneously and their axles changed within the space of 10 minutes.

At that time (1951) the Transfesa Company had in service a total of 162 refrigerator wagons and 110 ventilated wagons to the English loading gauge, capable of being shipped by the Dunkirk-Dover ferry service and of running over the British Railways system. Subsequently, between December, 1954, and March, 1955, an additional 1,000 ventilated wagons, all to the English loading gauge, were brought into service. The average load of the Transfesa rolling stock varies between 16 and 17 tons in the ventilated wagons and between 8 and 10 tons in the refrigerator wagons.

The phenomenal increase in traffic as a result of their entry into service can be gauged by the fact that in the last year of operating with the restricted fleet of vehicles a total of 4,261 wagon loads was exported from Spain to the rest of Europe, whereas in the first full year of operating with the increased stock (1955) the figure was 13,081 wagon loads. February, 1956, saw the disastrous frost in Spain which ruined the orange crop and as a result there was a slight decrease in the total traffic exported (12,485 wagon loads), but in 1957 the increase in traffic was resumed, the figure being 13,871 wagon loads.

The principal commodity exported is, of course, oranges, and taking the latest year for which figures are available (1957) 121,937 tons of oranges were exported in Transfesa wagons. Next in importance are grapes, of which 24,237 tons were conveyed in Transfesa wagons during 1957, followed by tomatoes (18,659 tons) and new potatoes (16,187 tons). Apricots, onions, pears, plums, peaches, melons, beans and other fruits and vegetables were also conveyed in much smaller quantities. A special word is required about the tomato traffic. It is largely as a result of the initiative of the Transfesa Company that the cultivation of tomatoes suitable for the English market has been introduced on the Spanish mainland and has developed into a major crop which is able to compete successfully with all other imported tomatoes in this country and elsewhere. Not only have existing traffics been increased, therefore, but new traffics have been introduced as a result of the facility for throughout transport by rail.

The principal destination country for Transfesa traffic, as for perishable traffic generally emanating from all producer countries in Western Europe, is Western Germany. Over 82,000 tons of Spanish produce entered that country in Transfesa wagons during 1957, of which 56,000 tons consisted of oranges. Great Britain is the second largest importer with a total of over 43,000 tons in 1957 and it is interesting to note that although we took very few oranges by the overland route (only 7,000 tons) we imported by far the largest pro-

portion of the Spanish tomato (15,000 out of a total of 18,000 tons) and potato (12,000 out of a total of 16,000 tons) crops. In the league table of importers of Spanish produce, France came third (30,000 tons), Belgium fourth (24,000) and Switzerland fifth (10,000). Traffic in Transfesa wagons also goes as far afield as Norway and Sweden, and for the first time in 1957 the Iron Curtain was crossed by Transfesa wagons in taking 262 tons of oranges and grapes to Czechoslovakia.

The development of this traffic has not gone unnoticed by competing means of transport and shipping has made strenuous efforts, not entirely unsuccessful, to capture the grape traffic which otherwise has a long haul by rail across Spain. That the other traffics are to a great extent maintained and even developed is due to the much speedier transit overland (Alicante tomatoes can be on sale in Covent Garden four days from being packed), the better condition in which the produce reaches the market, and the controlled, even flow of produce which is only possible in wagon loads.

The future offers even greater possibilities of development. With the partial lifting of the Iron Curtain new markets are opened up in Eastern Europe. With the introduction of the free trade area the possibilities of return loads to Spain are greatly increased. With the full co-operation of the railway administrations of Europe it is the intention of the Transfesa Company to achieve a constant user for its stock of wagons throughout the year, and as a token of its confidence in the future it intends to construct another 1,000 wagons during the next two years, and all of these will be to the English loading gauge.

* * *

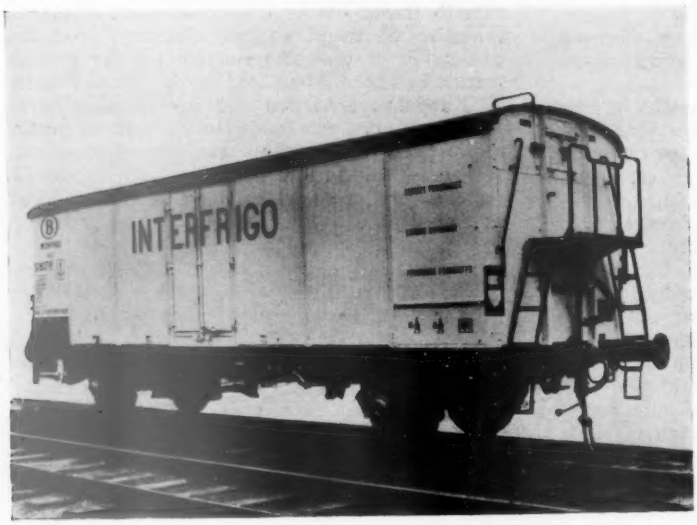
3—New Interfrigo Meat Wagons

THE first of 70 British-gauge Interfrigo meat wagons to be fitted with electrical ventilation are now going into traffic on British Railways for the throughout conveyance of carcase meat from Britain to the Continent via the Harwich-Zeebrugge and Dover-Dunkirk train ferries. All 70 wagons are to be fitted with electric ventilation by September this year.

The use of this electric system provides for greatly improved ventilation, particularly at low speeds ; allows perishable foodstuffs to be refrigerated before despatch ; and by the elimination of the overhead ducts used in air-operated equipment, gives headroom for the carriage of larger quarters of meat.

The equipment consists of four ventilation fans, each driven by a single-phase motor, built into screens, two at each end of the vehicle. The four motors obtain electric current from a belt-driven permanent-magnet alternator with bi-phase wind-

(*Continued on page* 621)



Exterior view of Interfrigo van.

Fig. 1.

Environmental Test Equipment

By B. J. MELVERN*

MODERN aircraft have to fly under widely varying environmental conditions. Temperature, air density and humidity conditions are constantly changing during flight and even on the ground a wide range of temperature and humidity conditions are encountered.

It is, therefore, of paramount importance that all ancillary equipment be tested under these conditions. In the early days flight testing of components was the accepted procedure, but this often led to radical equipment design changes at a time when proved equipment was really needed.

Modern equipment is now available in which the known environmental conditions can be simulated in the laboratory and Rotax have installed a comprehensive test facility of this type at their plant at Hemel Hempstead, Herts. (fig. 1).

This facility consists of a cold chamber and a high altitude chamber. The former is operated at sea level density, whilst the latter not only simulates the reduced densities encountered at high altitude, but is capable of supplying cooling air at reduced temperatures at a constant humidity. The high altitude chamber is suitable for simulated testing of ram air-cooled equipment for aircraft, the maximum speed of which does not exceed Mach 1·2 at 36,000 ft. and over.

Rotax have proposals in hand for an additional chamber to cope with the higher stagnation air temperatures encountered in flight up to Mach 2·5. The present facilities are the largest and most comprehensive available in Great Britain outside the national establishments.

Uses

The sea level cold chamber is used for the sub-zero testing of equipment which does not require ram air cooling and which would be unaffected by changes in air density. Components such as engine starters which have to operate at the minimum ground temperature experienced and actuators which have to operate in flight, as on the ground, after being subjected to sub-zero soak temperatures at sea level or at altitude, are examples.

The high altitude plant on the other hand is used for

* Rotax Ltd. "M.R" acknowledges with thanks the co-operation of this firm in supplying text-matter and in loaning plates.

simulated flight conditions of components which normally take ram air for their effective cooling, high voltage components the spark-over distances of which are affected by reduced air density, and all machines employing brushes, commutators and/or slip rings where the extreme dryness of the air at higher altitudes can impair the lubricating film necessary for minimum brushwear. D.C. generators, motors, invertors and alternators are among the types of components for which the chamber is required.

Generally, these chambers will prove the materials used in the construction, the adequacy of the limits, the suitability of greases, rubbers, insulation materials, etc., and the efficiency of the cooling system. In addition, the high altitude chamber is proving invaluable for brush-wear tests.

LOW TEMPERATURE (Sea Level) TEST PLANT

This plant is designed to test equipment that may be subjected to low temperatures but not high altitudes. For example, an undercarriage actuator is normally required to operate at very low altitudes but during the course of a flight can be subjected to extremely low temperatures, and may still be very cold when required to operate. Equipment can be affected in many ways when subjected to low temperature. For instance,

1. Electric motors that are not totally enclosed and which may have been exposed to a moist atmosphere before being subjected to low temperature, may be effected by commutator icing thus rendering the motors impossible to start especially at low voltages, *e.g.* 28 volts.
2. Metal contraction may cause clearances to become either too small or too large.
3. Thickening, and even solidification, of greases and lubricants can cause abnormally high friction and in some instances complete seizure between moving parts; this can be overcome by using low temperature greases and lubricants.
4. Rubber hardens and becomes brittle at temperatures below –40° C. If cables are moved under these conditions the rubber insulation will crack.
5. In fuel-burning apparatus the fuel does not vaporize so readily as at normal temperatures, thus starting becomes difficult without using a starting aid, *e.g.* ether.

When installing and operating a low temperature test plant, several factors have to be considered. These are :—

1. Reducing the temperature of the chamber and its contents to any value down to –70° C. and maintaining the temperature to within close limits.
2. Circulating dry air through the chamber to ensure that no frost is deposited when the temperature is reduced.
3. Circulating air inside the chamber, at low temperature, to ensure even cooling.
4. Separating oil from the refrigerant and extracting air and moisture from the system.

Fig. 2.—Interior of low temperature (sea level) chamber.

Sea Level Chamber

This chamber, which has a temperature range of + 20° C. to –70° C., is 25 ft. long × 15 ft. wide (working width is 12 ft.) × 10 ft. high, and is fitted at one end with an airlock 12 ft. long × 9 ft. wide × 8 ft. high. Fig. 2 shows the interior of the chamber, a part of the airlock being visible through the observation window. A door 11 ft. long × 12 ft. 9 in. high × 10·5 in. thick is fitted to the chamber at the opposite end from the airlock and is lifted by means of a block and tackle mounted on a gantry. The inner and outer walls of the chamber are separated by a 3-in. air gap which is supplied with dry air ; the inner walls consist of aluminium sheet lagged with 12-in.-thick glass-fibre, and the outer brick walls are coated with bitumen over which is fitted an aluminium foil vapour seal. The roof, which also has a 3-in. air gap, is similarly lagged with 12-in. glass-fibre. This is enclosed by 4-in.-thick poured concrete and covered by bitumen and a vapour seal ; two exhaust tubes are fitted to enable diesels and vehicles to be run for a limited period. A 7-kW. heater is embedded in the 4-in.-thick concrete floor so that, when the temperature is raised in the chamber, the temperature differential across the thickness of concrete can be reduced thus preventing a tendency for the floor to crack. Below the surface concrete is a layer of cork 12 in. thick and under this the main concrete foundation.

As seen on the right in fig. 2, cooling evaporators are fitted and above these are two banks of heaters having a total capacity of 100 kW. ; air-circulating fans, driven by motors outside the chamber, are positioned above the heaters.

Drying Plant

A twin re-activating silica-gel plant is mounted on top of the air-lock and is used for drying the air circulating in the chamber and the air gap between the lagging, walls and roof. During low temperature tests no fresh air is brought into the chamber but before reduction in temperature the doors are closed and dry air is circulated for two hours at a frost point of approximately –40° C. The reason for this is to prevent severe building-up of ice on the evaporators during low temperature conditions which, if allowed to form, could reduce the efficiency of the plant.

When refrigeration commences, the dry air to the chamber is switched off and diverted into the airlock, the air circulating through the walls being maintained during the tests. The dry air in the airlock enables personnel to enter the chamber without the risk of ice forming on the evaporators which would occur with the ingress of moist air.

At the conclusion of the tests, the temperature in the chamber is returned to normal ambient by means of the heaters.

Refrigeration

Refrigeration is obtained by a three-stage compressor plant using " Freon-12 " (dichlorodifluoromethane) as the

Fig. 3.—Refrigerating plant—low temperature chamber.

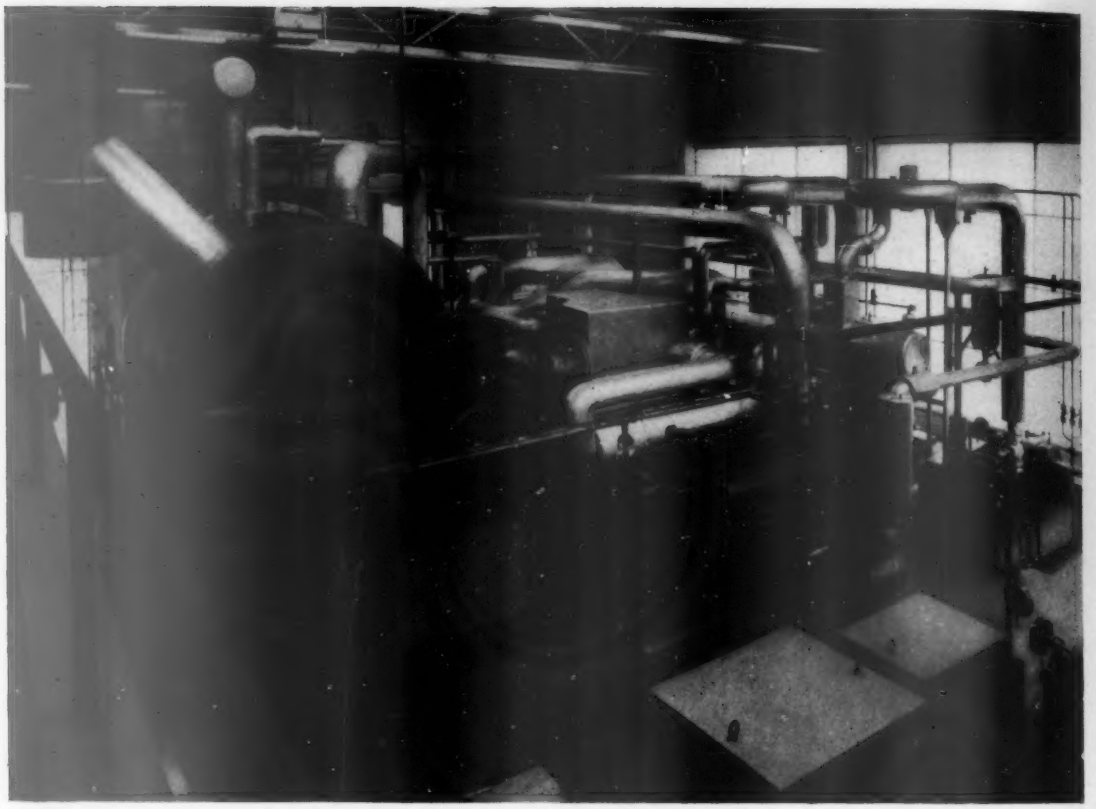


Fig. 4.—Refrigerating plant—high altitude chamber.

refrigerating medium. These compressors and the refrigerating equipment can be seen in fig. 3. The third stage consists of two compressors connected in parallel which accounts for the four units shown in the illustration. The high stage will cool the chamber to –15° C. in one hour, the addition of the intermediate stage will reduce the temperature to –40° C. in a further two and a half hours. From –40° to –70° C. takes 22 hours with the addition of the two low-stage compressors. Because air, oil and water mix readily with " Freon," the design of the plant is such that air can be purged, oil separated and water removed by drying.

1. *Intercoolers and Sub-cooling*

The number of compressors used depends upon the required temperature. The high stage alone will give a room temperature of approximately –25° C. The high stage plus the intermediate stage will give approximately –40° C. and the total plant will give a temperature of –70° C. When only the high stage compressor is used, the difference between the condensed liquid temperature and the low pressure receiver liquid temperature is relatively small so that no sub-cooling is necessary. Also, the temperature of the gas entering the suction side of the high stage compressor is low (coming straight from the low-pressure receiver) and therefore no intercooling is required. For these reasons the first stage intercooler is used only when the intermediate stage compressor is connected into the system. Similarly, the second-stage intercooler is used only when the low-stage compressors are connected into the system.

As already mentioned, " Freon " liquid enters the intercoolers after passing through the high-pressure receiver. However, before entering the first intercooler, a quantity of liquid is diverted, expanded and supplied to the intercooler where it sub-cools the main liquid. The cold secondary liquid is then diverted to cool the gas line between the intermediate- and high-stage compressors. A thermo-bulb in the main gas line operates a solenoid expansion valve which controls the amount of secondary liquid entering this line.

This system is repeated on the second intercooler which further sub-cools the main liquid while the secondary cold liquid cools the gas between the low- and intermediate-stage compressors.

2. *Purge Unit*

Air, which can gain access from the shaft seals of the compressors, must be removed because it is not a refrigerant and therefore must be prevented from entering the evaporators. Air in the system also has the effect of increasing overall pressures. It is removed in the following manner.

A sample of gas and air is taken, via a line which joins

Fig. 5.—Interior of high altitude chamber.

the system just prior to the condensers, to the purge unit which has passing through it a secondary coil containing condensed and expanded liquid. The gas is cooled, changed into a liquid and is returned to the high-pressure receiver. The air or non-condensible gas remains at the top of the purge unit where it can be manually discharged to atmosphere.

3. *Oil Still*

Although the oil has been separated by the gauze filter already mentioned, it is possible for some to be delivered to the low-pressure receiver and evaporators. Obviously this is not required and is removed in the following manner.

A sample of " Freon " liquid and oil is pumped from the low-pressure receiver to the oil still where a secondary coil is carrying the relatively warm condensed liquid. The cold liquid then vaporizes and is returned to the inlet side of the high-stage compressor. The oil which has not vaporized falls to the bottom of the oil reservoir where it is returned to the oil receiver which is used for maintaining the oil level in the compressor crank cases.

4. *Water Drier*

This is a twin alumina unit which is situated as near as possible to the condensers and high-pressure receiver because the possibility of the main source of water leakage from the condensers. Normally the " Freon " is passed over one bed, the other being closed. After six months the " Freon " is passed over the second unit while the first is removed and recharged with fresh alumina.

5. *Temperature Control*

Any temperature can be obtained from + 20° C. to - 70° C. and can be controlled to ± 0·5° C. This is achieved by a 25-kW. heater which forms a part of the 100-kW. heater already mentioned and which can be switched in 10 2·5-kW. banks. Temperature measurement is by a thermocouple connected to a recording instrument fitted with a controller for switching the heaters. It is obviously uneconomical to have the maximum amount of heat and refrigeration operating and therefore the compressors are arranged so that the valve gear can be lifted on any of the four twin-cylinder banks (compressors are eight-cylinder units in four twin banks). Thus any compressor can run on 25, 50, 75 or 100 per cent. capacity and all that is necessary is to unload the compressors until the minimum amount of heat required to control is being applied.

Auxiliaries

Three motor-generator sets are mounted outside the chamber and give the following supplies :—

24 volts, 800 amps.
18–30 volts, 350 amps.
72–116 volts, 250 amps.

These are connected to a switch panel in the airlock from which leads are taken under the floor to another panel inside the chamber. In a similar manner, single and three-phase supplies are available for equipment under test.

The main panel in the airlock is arranged so that shunts may be fitted for current measurement while, on a separate panel, voltmeters can be connected to equipment under test by means of 24 10-amp. leads. Lighting is supplied by eight 40-watt bulbs mounted in totally enclosed housings, and a carbon dioxide plant, for use in the event of a fire, can be operated from the airlock or from outside the chamber.

HIGH ALTITUDE TEST PLANT

The effects of high altitude on electrical machines fall, broadly, under two main headings :—

1. Brushwear ;
2. Cooling.

The brushwear problem is basically one of friction and contact drop. At ground level there is much more water vapour in the atmosphere than there is at, say, 60,000 ft. and it is the water vapour which inhibits wear.

Attempts to overcome the high friction have been made by adding adjuvants to the brushes, such as varnish, lead, barium fluoride, P.T.F.E. (polytetrafluorethylene) and molybdenum disulphide. Wear rates of brushes at altitude have been reduced to practical limits, though instances of abnormally high brushwear still occur and the reason for this has yet to be found.

The combination of friction and contact drop on brushes can cause severe heating of the brushes and commutator and indeed of the complete machine, because the cooling air is heated as it passes over these hot spots.

The problem thus resolves itself into producing a brush that will have a good practical life at altitude and which will enable a machine to be run, at high altitude, at its full rated output without exceeding its designed temperature rise. Thus the quantity of cooling air and its distribution through the machine are extremely important.

This problem of cooling electrical machines is therefore as important as brushwear and as operational altitudes and speeds increase, causing increased inlet temperatures, blast cooling becomes increasingly difficult.

In order to study the effect of brushwear and the behaviour of electrical machines at high altitude, several factors must be considered when installing and operating a high altitude test plant. The plant must :—

1. Simulate atmospheric conditions obtaining at altitudes up to 60,000 ft. These conditions being :—
   (*a*) Temperatures : from +20° to -60° C.
   (*b*) Pressures : from atmospheric down to 2·1″ Hg absolute.

(*c*) Humidity : frost point of –82° C. at 60,000 ft.

2. Provide 30 lb. per minute of air at conditions laid down in 1 (*a*), (*b*) and (*c*) for blast cooling equipment under test.

3. Provide a variable speed drive (maximum 10,000 r.p.m.) in order to drive generators and alternators which, in aircraft, are normally engine driven.

High-altitude Chamber

The high-altitude chamber is designed to operate at altitudes up to 60,000 ft. at any temperature between +20° and –60° C. and is used for determining the performance of any type of airborne electrical equipment which is required to operate under non-pressurized high-altitude conditions.

One of the most important factors at high altitude is the dryness of the air with which blast-cooled machines are supplied and the plant is so designed whereby this type of equipment can be supplied with air at a frost point of –60° C. at ground level, which is the equivalent of –75° C. at 50,000 ft.

The time taken to simulate 60,000 ft. is two minutes, to reduce the temperature to –30° C. is approximately two hours and to –65° C. approximately seven hours. The general arrangement of the plant, excluding vacuum pumps, is shown in fig. 4. The high-altitude chamber, which has an outside diameter of 14 ft., can be seen on the left. Rotating machines under test can be run to a maximum speed of 10,000 r.p.m. by means of a 170-h.p. drive mounted on a plinth outside the chamber. It has obviously been necessary to seal the chamber where the drive shaft enters and this has been accomplished in the following manner. The shaft is mounted in two bearings on each side of which is fitted a labyrinth of mild steel plates. Between the labyrinths oil is supplied and maintained at a vacuum slightly higher than that of the chamber. It is thus impossible to have oil leakage into the chamber ; in fact, air from the chamber would tend to leak into the seal.

The working space of the chamber is 8 ft. long × 6 ft. wide × 6 ft. 6 in. high and can be seen in fig. 5. Lagging, which is fitted to the inside of the steel shell, consists of 12-in.-thick Kapok covered by tongued and grooved cedar wood. A heater is fitted below the evaporators seen on the left in fig. 5, and fans, for circulating the air, are mounted in the roof above the grille. These fans are driven by a variable speed A.C. motor which is mounted outside the chamber above the main drive. Variable speed is necessary because, under altitude conditions, the mass of air at high altitude is very much less than at ground level; consequently the fan speed has to be increased.

Access to the chamber is through a door, which is covered by a large cedar wood airlock. The latter is not lagged but is supplied with dry air thus enabling personnel to enter the chamber under low temperature conditions without causing severe freezing of the evaporators. It is not possible to enter the chamber under high altitude conditions and indeed, the rate of evacuation of air is such that it would not be safe for personnel to be inside while the chamber is being evacuated.

Air Plant

Air, up to a maximum quantity of 41 lb. per minute which is taken from the atmosphere by a process fan, is first passed over a pre-cooler where its temperature is reduced to 5° C. and where considerable condensation occurs. It then passes through a Birlec alumina re-activating plant, in which it is dried to a frost point of –70° C. During this period, however, it is possible due to the performance of the drier for air to be raised in temperature to about 43° C. On leaving the Birlec, the air is cooled by means of a mains water after-cooler and then sub-cooled to 5° C. by means of a chilled water cooler similar to the one previously mentioned.

At this point the air is split, 10 lb. per minute being supplied to the airlock and 1 lb. per minute, through a throttle valve, to the chamber where it is circulated and cooled to the required temperature by means of the evaporators.

The remaining 30 lb. per minute passes through a cooler via a Fisher valve so that temperature control can be obtained and the air can be reduced to any temperature down to –60° C. On leaving the B, C and D coolers, the air passes through a mass flow measuring orifice plate, a throttle valve and then to the machine under test through the stop valve. Two machines under test can be supplied with air from the 30 lb. per minute, one machine being mounted to the main drive and the other, such as an invertor or a rotary transformer, mounted on the bench. Orifice plates are fitted and each line has motorized valves so that the amount of air to each machine can be measured and controlled.

It is possible, if so desired, to control the air in the chamber at one temperature and air supplied to equipment under test at another temperature. For evacuation of the chamber to any altitude up to 600,000 ft., a 35-h.p. vacuum pump is used. Air leaving the equipment under test is drawn out by four 100-h.p. vacuum pumps. On both sets of vacuum pumps (one 35 h.p. and four 100 h.p.) by-pass air supplies, through filtering valves, have been fitted. These valves, in conjunction with the throttle valves in the air inlet lines previously mentioned, are used to control the altitude and mass flow of air passing through the chamber and machine under test. It is thus possible to have the chamber at one altitude and the air supply to the machine under test at the same or a different altitude. The vacuum pumps work at maximum efficiency when the temperature is 10° F.; consequently, heaters have been fitted to the outlet of both the chamber and the equipment air supply to control the air inlet temperature to the pumps.

It is possible, if desired, to divert all the air to either the chamber or the equipment under test.

Refrigeration

The refrigeration system is similar to that described for the sea level chamber.

Auxiliaries

Electrical leads and 24 thermo-couple leads are brought out through a bulkhead in the chamber and connected to the main electrical panel in the control room. Fitted to this panel are electrical instruments together with temperature indicators, recorders and switches for metering the equipment under test.

Supplies connected to this panel from D.C. generators are :—

24 volts, 800 amps.
18–30 volts, 350 amps.
72–116 volts, 250 amps.

Load banks are provided for loading the machine under test, and comprise :—

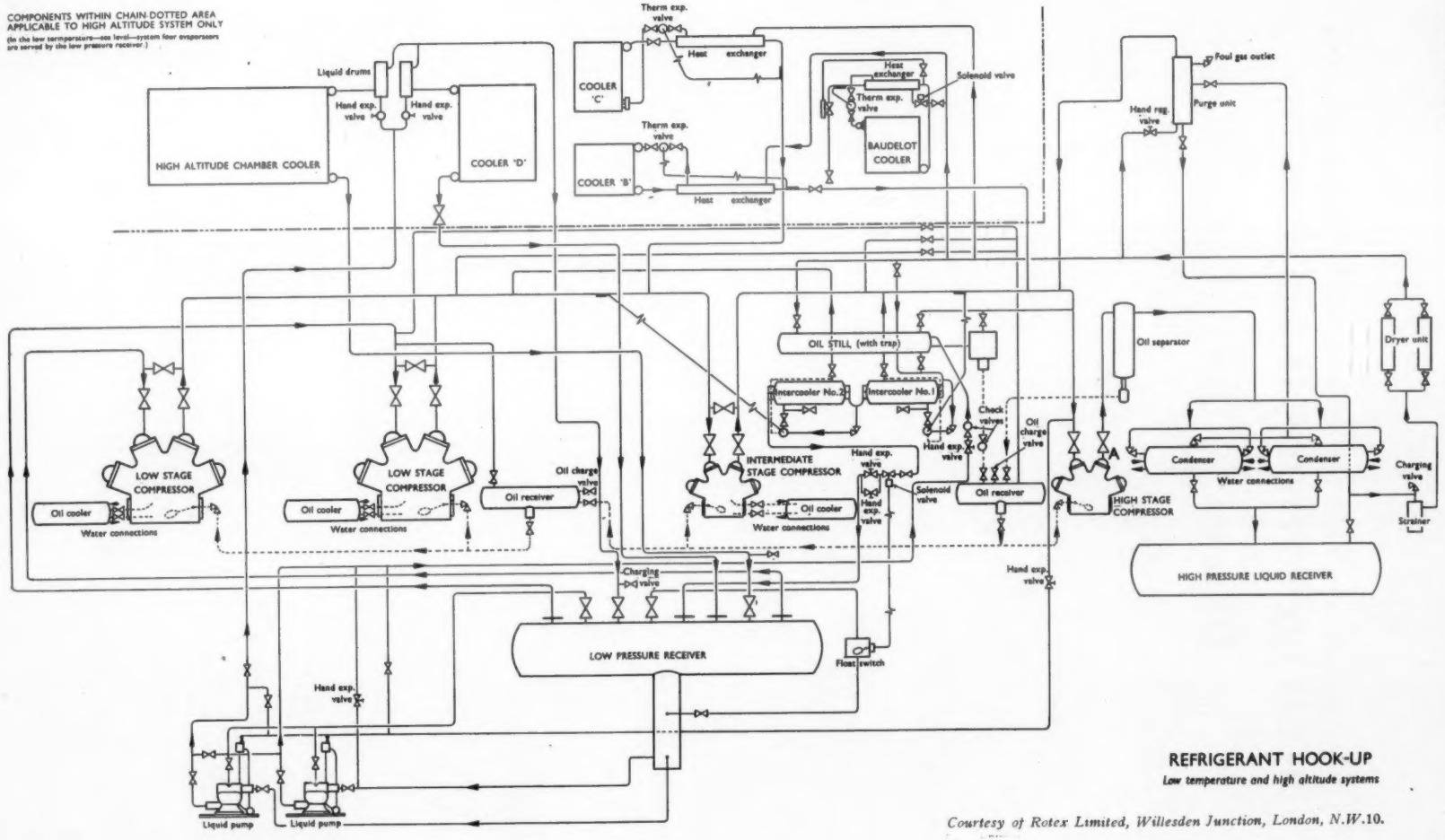
100 volts, 75 kVA., three-phase.
200 volts, 50 kVA, three-phase.
24 volts, 20 kW., D.C.
110 volts, 50 kW., D.C.

These loads and control panels are mounted on a balcony near the vacuum pumps.

All the motorized valves previously mentioned are controlled from the test rig panel which also includes temperature, mass flow and pressure instruments.

Five points, each connected to a hygrometer, have been tapped into the airlines so that the frost point can be determined at various stages. Intercommunication has been installed at 34 points throughout the building.

Environmental Test Chamber



REFRIGERANT HOOK-UP

Low temperature and high altitude systems

Courtesy of Rotex Limited, Willesden Junction, London, N.W.10.

Refrigeration Installations at Brussels Exhibition

A Photographic Eye at the "Expo"

A MOST successful British Electrical Conference was held in Brussels last month under the chairmanship of Sir Vincent de Ferranti, M.C., president, British Electrical and Allied Manufacturers' Association Incorporated; six other Associations co-operated in organizing this convention which was under the patronage of the Belgian Commissariat-General of the 1958 Universal and International Exhibition.

Two important papers were presented to the conference, the first being entitled "Communication between nations and peoples" by Sir Gordon Radley, K.C.B., C.B.E., director-general of the British Post Office, and the second "Nuclear energy, the power of the future" by Sir John Cockcroft, O.M., K.C.B., C.B.E., M.I.E.E., F.R.S., director, Atomic Energy Research Establishment, Harwell.

After discussing the development of Calder Hall, Dounreay, Windscale, Hinkley Point and other stations, Sir John declared:—

"We have not lost sight in the U.K. of other promising routes to nuclear power and we are carrying out an intensive research study on the heavy water, gas-cooled reactor. This reactor shares with the graphite moderated gas-cooled reactor, the advantage of using natural uranium or near natural uranium fuel. It has very good nuclear properties, which is good for fuel costs, and it has a smaller size than the graphite moderated reactor, which is good for capital costs. The economic prospects of this reactor seem to be about the same as those of the AGR. Technological factors will probably decide which of these is likely to lead in the reactor race of the late 1960s.

"In carrying out this programme of the development of nuclear power, the U.K. Atomic Energy Authority and British industry have established a partnership in which development work is effectively shared, while the operating and designing experience of the A.E.A. is made available to industry. Reactor physics experiments to determine the optimum lattice parameter of future reactor designs are carried out in common in the Authorities' laboratories and other development work is carried out jointly in the laboratories of industry. Fuel element cans are designed by the individual groups, so there is an important element of competition in achieving maximum heat ratings, but the fuel elements themselves will be fabricated by the Authority in their central facilities. This has the great advantage that the central testing facilities of the Authority can be used to the best advantage. Although the Authority has now three powerful materials testing reactors and associated shielded examination facilities, they are still likely to be extremely heavily loaded. The partnership with industry ensures that the volume of irradiation testing is greatly reduced over that which would be required by four or five independent groups.

"The A.E.A. also provides a consultative service to the electricity authorities. It advises the electricity authorities on the technical aspects of tenders received and provides advice on siting and safety problems.

"The Authority has now a central safety branch which is responsible for studying the safety aspects of reactors and approving operating codes.

"These consultative services are being made available to other countries who are interested in the possibility of constructing British designed reactors.

"We believe that Britain through this partnership of industry and the A.E.A. can offer a powerful, well-integrated service to other countries which is unique in the world. In this way we are making a major contribution to the development of nuclear power in the world.

"I have not had time to say anything about the exciting prospects of obtaining power by the fusing together of deuterium nuclei. The stars have been doing this for several thousand million years, so it is natural and exciting to try to emulate their performance by heating up deuterium gas to high temperatures by electrical discharges. Our research project ZETA is an encouraging first step on the way. We have produced a stable discharge channel carrying 200,000 A for several milliseconds and expect to improve greatly on this performance as we are able to feed in more and more energy. At present the energy released by the fusion reactions is less than a millionth of the energy input. We expect, however, to be able to raise the temperature beyond the few million degrees we have so far reached to tens of millions of degrees. To reach the break-even point we shall need to reach temperatures of over 100 million degrees in deuterium and 40 million degrees in a deuterium-tritium mixture.

"I do not think fusion reactors will supplement fission reactors for at least 20 years, and it may be much longer. But certainly it is a fascinating new field of research.

"The model ZETA in the exhibition well illustrates the principles on which we are working."

A casual visit to the Brussels Exhibition might not reveal a great number of refrigerating instalations but the writer found that 10 hours was insufficient time in which to photograph the widespread applications; many of these, of course, were "behind the scenes."

One firm alone, namely, S.A. des Ateliers B. Lebrun, Nimy, the most important refrigeration manufacturer in Belgium, was responsible for the supply and fitting of *eighty* compressors at the exhibition; these included 15 of their industrial

Shots from the Brussels International and Universal Exhibition (or "Expo 58" as it is called colloquially)

1. A general vista; heat pump machine house can be seen at head of central cascade.

2. Low temperature physics exhibit includes Philips gas liquefier, atmosphere analyser, adiabatic compressor and distillation trays.

1

3. Lightfoot Refrigeration's water cooling set in British Industries Pavilion.

4. French insulated door, 12 ft. high, for abattoirs.

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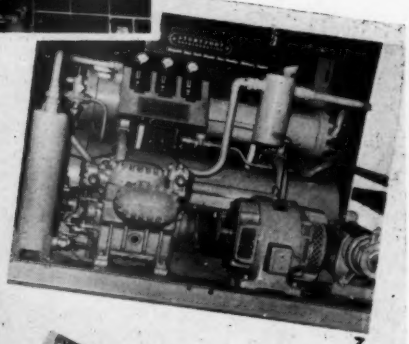

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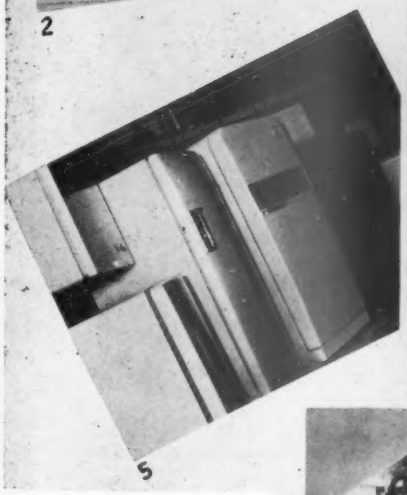

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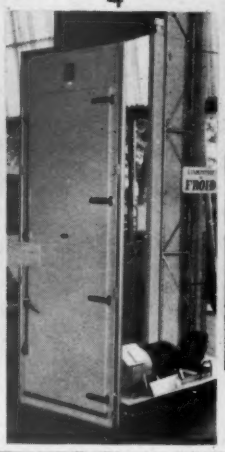

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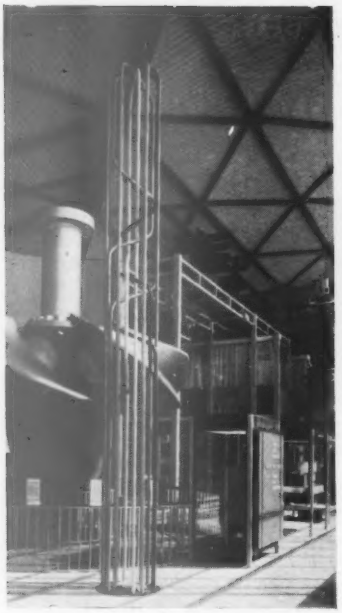
5. Typical French fridges (with one in black!). Top left is one with door hinged at upper horizontal edge.

6. French transport exhibit—Brancher - B.F.S. 4-cyl. compressor and Thermomobil unit for lorries.

7. Lebrun's heat pump machine house serving Atomium.



The execution of this intricate coil-work, symbol of the British Boiler-makers' Association, was entrusted to the Aero Pipe & Glass Company Limited, well known in the refrigeration field.

ME type; a great number of semi-sealed units and five hermetics. In the manufacture of these commercial units, Lebrun's have a licensing agreement with Prestcold of Oxford.

The most outstanding installations carried out by Lebrun's included the heat pump for air-conditioning the Atomium spaces; " Freon-12 " plants in the agricultural hall; air-conditioning equipment for the restaurant Marie Thumas; a water cooling installation in the Coca-Cola Pavilion; air-conditioning plants in the Urbanism Pavilion, in the Belgian Congo buildings—in fact, installations in 43 locations in the exhibition grounds. The bars and cellars offering the most delectable produce of France are all refrigerated.

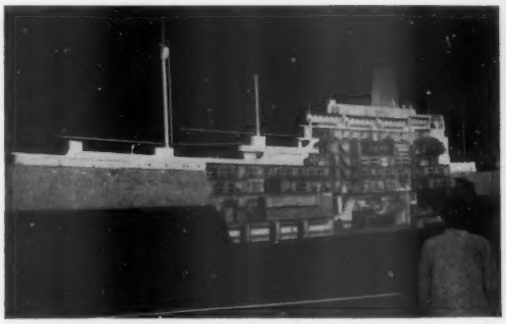
The now-famous Atomium, which must rank as one of the most photogenic structures in the world, has its own refrigerating machine hall located at the head of the scenic cascade which gently descends the centre of one of the main boulevards from " Atomium Square."

The Atomium heat pump provides hot or cold water, according to the need, for the air-conditioning heat exchangers, and the plant includes three sets of " Freon-12 " monobloc refrigerating machines. Each of these sets includes one 8-cylinder, VV compressor driven at the high speed of 1,500 r.p.m. by a 47.5-h.p. motor.

Belgian makers of refrigerating plant have been allocated a portion of the Ministry of Agriculture building and particularly impressive are the refrigerated display counters which are well finished; these included SEM and Fribo makes.

French makers have occupied a corner of the French Pavilion and the display has been

This red and stainless steel refrigerated counter is a good example of Continental production; it was made by SEM of Brussels. The exhibit was staged by Office Nationale des Debouches Agricoles et Horticoles.



This cut-away illustration of one of Belgium's crack liners, S.S. "Baudouinville," of the Compagnie Maritime Belge, shows refrigerated spaces and machinery installed by A. S. des Ateliers B. Lebrun.

One of the scores of restaurants in the Expo grounds; fitted with an enormous run of refrigerated "Frigos" counters by van Tilborg.

organized by the Chambre Syndicale Nationale des Fabricants de Materiel Frigorifique, by Frigexport Equipment d'Exportation des Constructeurs de Materiel Frigorifique and by L' Association Française du Froid. In this section, French domestic refrigerators are displayed by Frigeco (2), by S.A. Chausson, by Frigidaire, by Frimatic, by Electrolux and by Airwell (air conditioner).

In the International Hall of Science there is an educational exhibit entitled Physique du Froid which includes a Philips gas liquefier which can produce five litres an hour of liquid air; an atmosphere analyzer, Prof. Dr. A. Itterbeck's adiabatic compressor capable of producing a temperature 1/1,000ths of a degree off absolute zero and sieve type distillation trays for air separation loaned by the British Oxygen Engineering Limited, London. Two Interfrigo refrigerated rail vans were shown at the Exhibition.

English Electric have a good showing in the British Industries Pavilion. Miss Cynthia Shirley, head home economist, English Electric, left, is in charge.

Heat Transfer Research.—New and extensive facilities for research into mechanisms and metrology and heat transfer are now available at the Mechanical Engineering Research Laboratory D.S.I.R. at East Kilbride, near Glasgow. Visitors to this year's open days at the laboratory on June 4 and 5 were able to see the important work now going on in these fields. These two new buildings, completed only last year, provide the opportunity for much-needed research to progress still further and the metrology section is believed to be the best equipped of its kind in the world. It provides a service to industry and other Government departments, including the rest of the laboratory, for a wide range of precision engineering measurements. In fact, to enable accuracy when checking engineering components to be of the highest degree (if necessary, to millionths of an inch), the metrology wing is virtually a building within a building. This is to guarantee strict temperature control. All exterior windows are double-glazed and fitted with venetian blinds and the test rooms are surrounded by a temperature-controlled corridor. Each test room is supplied with air at the standard temperature of 68° F. through a system of ducting concealed in a false ceiling. The air-conditioning equipment includes heating and refrigeration with auto-control, and the floor is of polished hardwood blocks to minimize dust. Facilities in the heat division's new laboratory are equally impressive, and include large experimental bays and smaller physics-type laboratories. In order that research may be carried out effectively, it has been necessary to provide sources of heating and cooling on a large scale. A total power (a.c. and d.c.) of 1750 KVA is available.

NEW COLD STORES FOR HAY'S WHARF

FOLLOWING a declared policy of increasing and improving their refrigeration facilities in order to offer the best storage conditions for their clients' produce, Hays Wharf Ltd., have recently converted large warehouses at Symons Wharf between London Bridge and Tower Bridge into chambered cool stores. These stores are known as " Symons A cold store " and " Symons C and D cool stores."

Symons A cold store is situated on the riverside at the north end of Abbots Lane, Tooley Street, London, S.E.1 and has been constructed by insulating a portion of an existing steel framed warehouse 330 ft. long built in 1939. The whole of the ground and second floors and the east and west uninsulated parts of the remaining floors have been retained for ordinary warehouse use. The four insulated floors are designed for a temperature of 10° F and have a gross cube of 360,000 cu. ft. Insulation is by Onazote throughout, 4 in. on the walls and under the lowest floor, 5 in. under the ceiling of the top floor. The walls are faced internally with 2 in. breeze and cement rendering. The whole of the work was carried out by Hay's Wharf Limited with direct labour in an overall time of nine months, the design and installation of the refrigerating plant being under the supervision of Colonel H. Randal Steward, T.D., B.SC., M.I.MECH.E., A.M.INST.C.E., M.INST.R., chief engineer to the company.

Chamber cooling is by air circulated over cold brine coils, there being six coolers to each chamber. Miniveil air curtains are provided at all insulated doors except that opening to the riverside staircase which is the emergency way out and is not in general use. Control of humidity is not provided.

The ammonia compressors, condensers, brine coolers, switchboard and all brine and water-pumps are situated on the first floor, condensing water being supplied by a forced draught water cooler on the roof. Defrosting is achieved by passing warm brine through a separate circuit in the air coolers. The store is on Lloyd's Register and has the normal standby capacity. The whole plant is completely automatic.

Cold air is circulated from six air coolers on each floor along ceiling ducts discharging through ports in the sides; air returns to the cooler through the base in the manner usual with this type of equipment. Each cooler is designed to pass 7,720 cu. ft. per minute (or 46,320 cu. ft. per minute for each floor).

Three thermostats are provided in each chamber operating in parallel, the closing of any one causing all six coolers on the floor to start.

The plant has been designed to run at a suction temperature of − 8° F. when maintaining rooms at 10° F. and under these conditions an average brine temperature of − 1½° F. is achieved with air in and out of the cooler at +10° F. and +5° F. respectively.

Brine is cooled by evaporators situated in the engine room. These evaporators are of shell and tube construction 30 in. dia. by 16 ft. long. Five hundred gallons of brine is stored in two tanks on the roof being connected to the bottom of the evaporators through two interconnected 6 in. pipes. From the top of the evaporators a header connects to the suction of five brine pumps, one for each floor and one standby. Separate deliveries from these pumps circulate brine through the floor coolers and then through open deliveries into the roof tank. The pumps are of the single-stage, centrifugal type running directly connected to 12½ h.p. motors at 2,900 r.p.m. and each circulates 10,700 gallons of brine per hour against a 85-ft. head. Pump starters are incorporated in the switch-board.

A view of a typical air-cooled chamber showing cooler.

Another view of same chamber featuring the special ducting.

All pumps including standby have "auto-off-hand" switches and changeover "normal-standby" switches on the switchboard. Brine circulates through all the coolers on each floor in parallel. Automatic operation for brine cooling is obtained by means of three thermostats placed in the roof brine storage tank set at different temperatures.

The ammonia compressors are of the enclosed, single-acting four cylinder VW type, the cylinders being 5¾-in. bore x 5¼-in. stroke. At 700 r.p.m. the three together are capable of 90 tons of refrigeration when operating with suction at -8° F. and condensing at 95° F., these being the correct operating conditions for the plant when maintaining a chamber temperature of 10° F.

The compressors are driven by Vee-belts from motors developing 100 h.p. when running at 1,450 r.p.m. There are three thermostats in the brine tank which bring into service one, two or three compressors according to the duty required. Each compressor is fitted with a hand-off-auto switch and there is also a sequence selector switch enabling the machine to be called into service in any order, thus ensuring equal use and a further standby selector switch to place any of the four machines in reserve.

PLANT SUPPLIERS:—

Compressors, evaporators, condensers and air coolers. The Lightfoot Refrigeration Co. Ltd.

Brine and water piping. Kirk & Co.

Water cooling tower. Film Cooling Towers.

Auto switchboard. Edward Holmes.

Insulation cold and other pipes. Onazote Insulation Co. Ltd.

Calorifiers. Hartley & Sugden Ltd.

Electric thermometers. Negretti & Zambra Ltd.

Internal telephones. Communication Systems Ltd.

HERRING FREEZING STANDARDS

STANDARDS for quick-freezing and cold-storing herring and herring products were introduced on May 1 under statutory rules which have been approved by Ministers. These rules are effective for one year. This will give the trade time to prepare for the prescription of the more exacting standards considered to be a desirable longer-term objective by both the board and those engaged in quick-freezing and cold storage. The treatment to which herring shall be subjected in the process of quick-freezing shall be such that:—

(*a*) the time taken to reduce them through the temperature range from 32° to 23° F. does not exceed two hours;

(*b*) the temperature at the mid-point of the thickest section of the product on removal from the apparatus by which the temperature was reduced as prescribed by sub-paragraph (*a*) hereof does not exceed -5°F.;

(*c*) the herring immediately after removal from the apparatus in which their temperature has been reduced as hereinbefore prescribed, shall have been glazed by spraying with, or immersion in, clean, fresh water of which the temperature does not exceed 40° F., provided that glazing need not be carried out if before entering them into the freezing apparatus each block, slab, package or parcel of herring is wrapped in a moisture-proof wrapper of which all the edges overlap, and

(*d*) the process is completed not later than 5 p.m. on the day following the day on which the herring were landed, provided that herring that are to be quick-frozen after midnight of the day of landing shall, immediately on landing, have been placed in clean containers and have been iced with sufficient crushed or flaked ice to ensure that such ice shall not all have melted by the time the process of quick-freezing the herring commences.

B.E.P.C.—The British Electrical Power Convention makes its third visit to Brighton, for its 10th annual meeting from June 16 to 20, under the presidency of Sir George Nelson, BT., LL.D., F.C.G.I., DI.C., M.I.MECH.E., M.I.E.E., chairman, English Electric Co. Ltd. The convention proceedings, which will take place in the Dome, have as their theme this year "Electricity and world progress: Britain's contribution." The subject will be covered in five papers dealing with the development of nuclear energy for electricity supply in Great Britain and overseas, Britain's part in electrical development overseas, British hydro-electric plant and world power requirements, and the development of the electrically equipped kitchen. This year's vice-president is Mr. C. R. King, C.B.E., companion I.E.E., M.INST.F., deputy chairman, Central Electricity Generating Board.

* * *

EDA'S New Officials.—Mr. Thomas Johnston, C.H., LL.D., J.P., F.E.I.S., chairman of the North of Scotland Hydro-Electric Board, has been appointed president of the British Electrical Development Association in succession to Viscount Chandos. Lt.-Col. E. H. E. Woodward, C.B.E., M.C., T.D., B.SC.(ENG.), M.I.E.E., has been appointed a vice-president of the Association. Col. Woodward was a member of the British Electricity Authority and the Central Electricity Authority until last December. Mr. W. N. C. Clinch, M.I.E.E., controller, Eastern Division, Central Electricity Generating Board, has been elected chairman of the EDA Council, for the year 1958–9, and Mr. T. E. Daniel, M.ENG., M.I.E.E., A.M.I.MECH.E., chairman, North Western Electricity Board, has been elected vice-chairman.

The "C" and "D" Stores At Hay's Wharf

The two warehouses, known as Symon's C and D, are situated on the land-side of Symon's Wharf with access by crane from the balconies or over bridges from the water-side. Both consist of five floors, each floor being maintained at a temperature of 43° F. Temperatures down to 33° F. are available if required. The individual chamber capacities vary in size from 14,000 c.ft. to 19,000 c.ft., the total capacity of the whole store being approximately 160,000 c.ft.

The equipment used to refrigerate the new cool stores has been provided by Frigidaire Division of General Motors Ltd., and supplied and installed by Haynes & Orengo Ltd., Frigidaire distributors for south-east London.

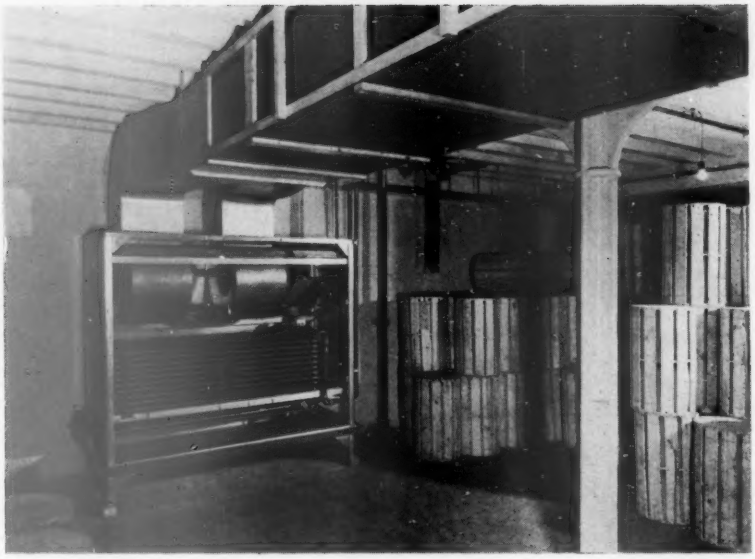
Each chamber is cooled individually by a Frigidaire water-cooled compressor, model WD6BS-500/M, operating in conjunction with a floor-mounted forced-air evaporator, model SFF-103/D, the 10 condensing units being situated in pairs on each of the five adjoining floors.

The compressors are cooled by water from a Heenan and Froude Aquatower on the roof of the building which operates at the rate of 127 gal. per minute at 75° F., and to prevent freezing in cold weather the cooler contains two 3-kW. immersion heaters thermostatically controlled. Circulation pumps are by Worthington-Simpson.

The system of cold air circulation throughout the rooms is operated by use of ducting, special transfer ducts having been designed to enable the evaporators to be connected to the main ducting on the discharge side. These transfer ducts also incorporate flaps which close automatically when the plant is not operating, thus eliminating heat transference into the main ducting during the defrosting periods. The flaps are controlled entirely by the air flow.

Left: Typical chamber in the "C" and "D" group.

Below: Aquatower on the roof.

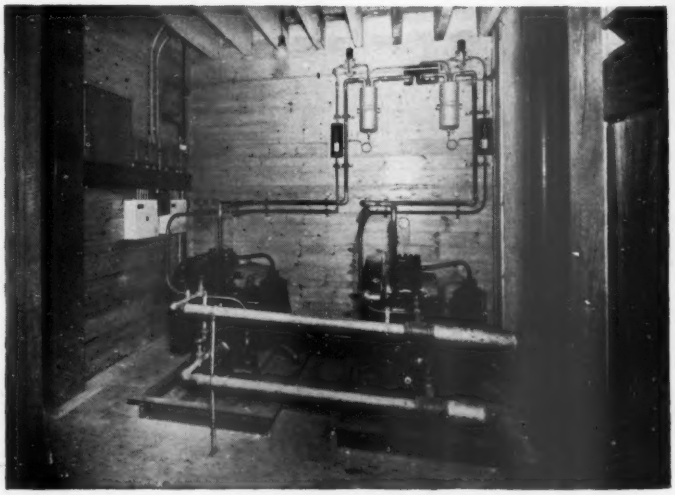


Cooler with front panel removed to show design.

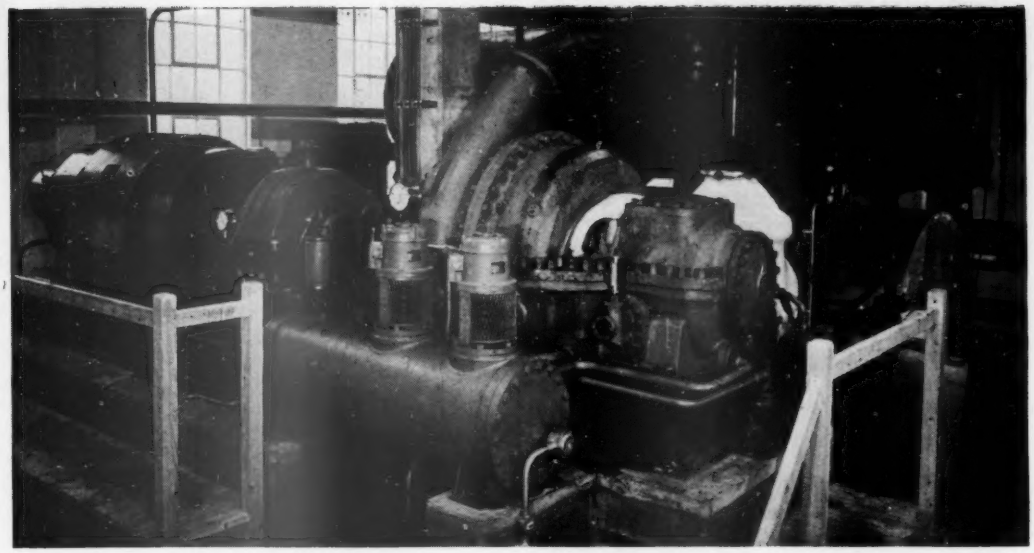
The condensing units and evaporators operating on each floor have been fitted with " Frostmaster " automatic defrosting with time switches synchronized to give a different defrost period to each forced-air unit. A somewhat similar electrically operated time delay switch has also been specially designed to operate with the compressors so obviating the possibility of starting simultaneously.

The insulation for the stores has been provided by Onazote Insulation Co. Ltd. For the ceiling of the top floor 3-in. Onazote has been placed between the floor joists and for the walls 2½ in. and 2-in. insulation protected by timber matching. In addition 2-in. Onazote has been supplied for the doors and for the refrigerant suction lines.

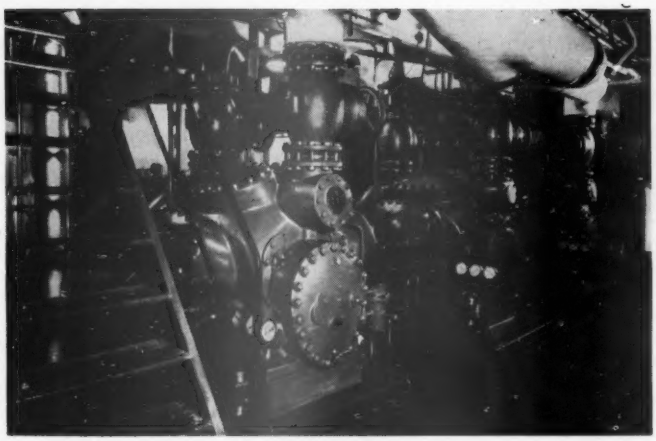
The whole of the refrigeration equipment in both warehouses is entirely automatic and all condensate and defrosting water are carried away through a piped draining system.

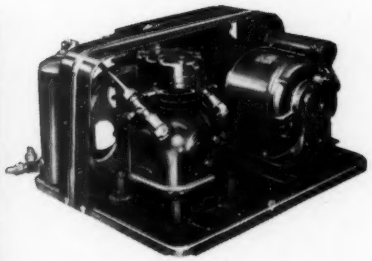


One of the engine rooms, typical of the series.



Refrigeration for all Commercial and Industrial Purposes





J. & E. Hall Ltd. manufacture refrigerating compressors for all commercial and industrial purposes ranging from $\frac{1}{6}$ h.p. to over 1000 h.p.

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REFRIGERATION, LIFT AND ESCALATOR ENGINEERS

AP 115

Refrigeration Controls—6

PRESSURE-OPERATED TYPES

By H. H. EGGINTON

(*Continued from May issue*)

SUCTION PRESSURE AND EVAPORATOR PRESSURE REGULATORS

THIS heading covers two very important controls which unfortunately often get confused. A suction pressure regulator is a hold-back valve and is intended to limit the pressure in the suction pipe going to the compressor. Alternative names by which it is known are : crankcase pressure regulating valve, crankcase protector or start regulator. Its function is to sense downstream or suction pressure, metering the passage of superheated refrigerant vapour so that excessive pressures do not overload the compressor.

An evaporator pressure regulator senses upstream or evaporator pressure, and controls the passage of refrigerant vapour to the compressor, so maintaining the preset evaporator pressure and therefore temperature.

It will be appreciated that the controls are, on no account, interchangeable, because they sense in different directions. In addition, the suction pressure regulator is a motor overload protection device, its primary function being to stop suction pressure rising, whereas the evaporator pressure regulator is an evaporator pressure and temperature protection device and its primary function is to stop pressure falling.

Suction Pressure Regulator

For all practical purposes, this device can be considered to be a large orifice constant pressure valve, so designed that the large seat which is used to avoid restriction of the passage of vapour, together with changes in evaporator pressure, do not upset the pressure at which the valve opens and closes. As with the constant pressure valve, the downstream pressure must be the only controlling factor, but unlike the constant pressure valve, the valve area cannot be kept small in relation to the prime mover and hence special balancing arrangements have to be made in the design of the suction pressure regulator valve mechanism. If this is not done, then evaporator pressure changes alter the opening and closing points of the valve.

The capacity of a suction pressure regulator is usually determined as the amount of refrigerant vapour which will pass through the fully open valve with a given pressure drop, at a given vapour temperature. The fully opened valve is used because the change in pressure required to take the valve from closed to open position is less than the difference in suction pressure between working and overload conditions. For example, if the valve is set to give shut-off at 20 p.s.i. and when the compressor is running the suction pressure is 0 p.s.i., then a pressure change of 20 p.s.i. is available to move the valve. If the regulator has a throttling range of 17 p.s.i., *i.e.*, goes from open to closed condition with this change in pressure, then on the plant the valve will be fully open during running conditions below 3 p.s.i.

The capacities of most valves are quoted for a 2 p.s.i. pressure drop or pressure difference between inlet and outlet, for a variety of evaporator temperature/pressure conditions. It may, however, be necessary to select valves with capacities based on as low as $\frac{1}{2}$ p.s.i. pressure drop, when operating with refrigerants in the vacuum range, since higher pressure drops may well mean a severe restriction of the overall capacity of the plant.

Principal Requirements

(1) Their construction should be such that they are not erratic, bearing in mind the considerable changes in working conditions of pressure and temperature. Adjustment caps should effectively seal to avoid ice or moisture depositing on the prime mover.

(2) The valve seat area should be balanced so that the upstream or evaporator pressure does not affect the control of the downstream or suction pressure. In the larger regulator this is achieved by using a pilot operating a servo mechanism

in which the pilot valve area is very small compared with the prime mover area.

(3) The valve should be capable of changing from fully closed to fully open with a pressure change of some 10 to 20 p.s.i. and have a range of adjustment 0 to 40 p.s.i. For higher pressure refrigerants and ammonia, 30 to 110 p.s.i. and 0 to 60 p.s.i., respectively, are used.

(4) The valve mechanism must have really good shut-off characteristics and the materials of construction must not be affected by temperature or pressure changes to upset the quality of shut-off.

(5) It is desirable, but not essential in all applications, that the valve mechanism have some form of damping to avoid oscillation of the valve head which can be associated with gas flow and compressor piston action. Such damping is usually achieved by friction spring fingers, or dashpot action, which introduce hysteresis into the mechanism and stop the valve responding too quickly to rapid changes in pressure. In this way noise and rapid wear are avoided.

Construction

Brass construction is used for most of the halogen type refrigerants with iron, steel and stainless steel in ammonia applications. Flare, sweat or flange connexions are used, depending on the size and application of the valve. For most regulators not intended to utilize a servo mechanism it is common practice to use the bellows type prime mover to achieve the valve lift required to give full flow condition without excessive pressure drop through the valve and also to avoid pressure/system rate complications which would mean that the valve would have little chance of going from fully closed to fully open position in a small enough change of pressure.

To achieve large capacities, evaporator pressure regulators are designed, containing within themselves a form of servo mechanism, such that by the operating pressures in the valve, pistons can be operated, moved up and down to open and close main valve. Alternatively, the servo mechanism can be a separate part from the operating pilot, in in which case, a large piston valve assembly is caused to actuate by a constant pressure valve. Diaphragms are commonly used in pilot-type valves where a servo or main valve is capable of moving to the full flow requirement and therefore as long as the pilot can transmit the pressure without appreciable drop, it does not need a large valve mechanism.

Metal-to-metal valves and seats are used as well as rubber, plastic and other synthetic inserts to achieve better shut-off characteristics. When soft seats are used it is important that excessive bedding in of the valve is avoided by introducing a metal stop, so that after sufficient pressure has been achieved between the metal valve head and the soft seat to achieve good shut-off, then physical stopping of the valve head movement is undertaken to avoid overloading and extruding or deforming of the soft seat. Such deformation not only tends to put the valve off range, but also introduces an apparently high hysteresis effect.

Operating Characteristics

The suction pressure regulator operates in sympathy with the compressor :—

(*a*) When load in terms of evaporator pressure transmitted to the suction pipe is greater than the compressor ability, it closes.

(*b*) When load in terms of evaporator pressure transmitted to the suction pipe is less than the compressor ability, it opens fully.

(*c*) When load in terms of evaporator pressure transmitted to the suction pipe is intermediate between these two extremes it proportions the flow of refrigerant to the compressor's capability.

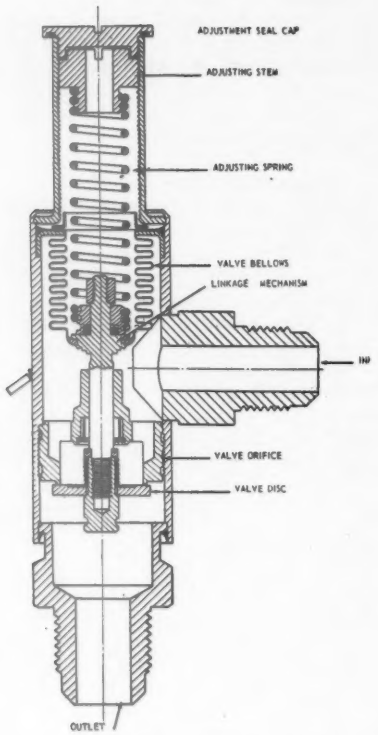
The internal construction of three typical valves are shown in the following pages, represented by :—

(1) The A.P.237 type valve, fig. 12.
(2) The Alco type 771 valve, fig. 13.
(3) The Alco CP pilot valve, fig. 14.

The actuation of each of these valves is slightly different and therefore to appreciate the operating characteristics it is considered that the mechanisms should be described.

Direct Operating Type Suction Pressure Regulator

Fig. 12 shows the valve where the inlet connexion is made to the evaporator and the outlet to the suction pipe. It will be seen that when the valve closes the pressure is equalized between the bellows and the valve head because these have equivalent effective areas, that is to say, that the load as a result of pressure on the bellows will be endeavouring to close the valve but this will be equal and opposite to the load on the valve head attempting to open it as far as the pressure fed through the inlet connexion is concerned. Since the bellows and valve head are of equal area and opposed, then the pressure in the outlet connexion is, in effect, opposed directly by the range spring adjustment and therefore, when the valve is in the closed condition, a fall in suction pipe pressure causes the valve head to operate without regard to the evaporator pressure. Once the valve head opens, however, the evaporator pressure bleeds into the suction pipe and as a result the suction pipe pressure is increased, causing the valve to close until the compressor has dealt with this load. The valve modulates in this fashion until it has emptied the evaporator of its extreme pressure. This means that the evaporator is unloaded

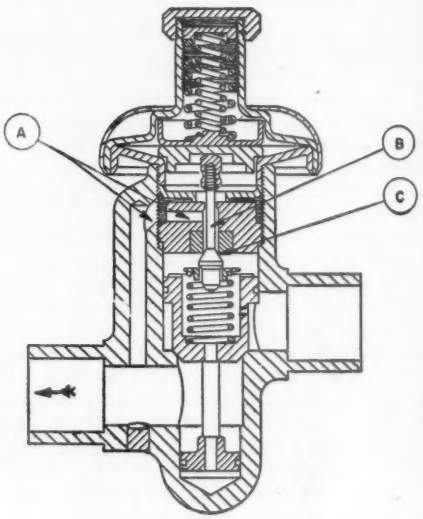


By courtesy A.P. Controls Corp., U.S.A.

Fig. 12.—Suction pressure regulating valve, A.P.237.

gradually so that a motor overload condition does not occur, and ultimately the suction pipe and evaporator pressures are equal. In this condition, the pressure on either side of the valve head is equal but no change in setting takes place because the bellows now opposes the range spring and the effective area of the bellows is equal to the valve head. Thus it will be seen that the design of this valve, by matching effective areas of valve head and bellows, achieves the state of affairs where a very large valve head can be used without getting out of balance thrust forces upsetting the set point due to changing evaporator pressure.

In the case of the type of suction pressure regulator illustrated by fig. 13, avoidance of setting change due to the evaporator pressure is achieved by using a small orifice which has an area infinitely small in relation to the operating area of the prime mover, in this case a diaphragm. It will be noticed that this system is very similar to that used in expansion valves. However, referring to the diagram, the compression suction pressure is transmitted through the passage (A) to the space beneath the diaphragm where it exerts its pressure against the spring pressure on top of the diaphragm. When the compressor suction pressure drops below the value of the spring pressure, the diaphragm moves forward pressing the pilot stem and pin (B) in an opening direction with respect to the pilot port (C), allowing the pressure in the space above the piston to be reduced by flowing into the passage (A). This exhausts the pressure above the piston and this pressure is taken away faster than it can bleed through the pilot hole shown in the piston. It will be noticed that the piston is so



By courtesy Alco Valve Company, U.S.A.

Fig. 13.—Internally pilot-operated suction pressure regulator.

designed that the upstream or evaporator pressure, which is higher than the compressor suction pressure, operates on an annular ring at the top of the piston and the differential pressure across this annular ring lifts the piston, allowing vapour to flow through the main port.

When the compressor suction pressure approaches and exceeds the spring setting the diaphragm is moved upwards, allowing the spring in the piston to move the pilot stem and pin in the closing direction towards the pilot seat, thus reducing the escape of vapour from the top of the piston. In this case, the bleed through the hole in the piston exceeds the rate at which the pressure can escape above the piston and therefore the pressure across the piston is balanced and the spring takes over closing the valve by its down-

THIS supplies

CHILLED WATER

FOR PROCESS COOLING

FOR AIR CONDITIONING

using low pressure steam from existing heating boilers
or other hot fluid

The Carrier Automatic Absorption Refrigerating Machine is a highly economical unit that provides a constant supply of chilled water for process cooling or air conditioning, where steam or other suitable high temperature fluid is available. Fully patented in Great Britain and all principal countries.
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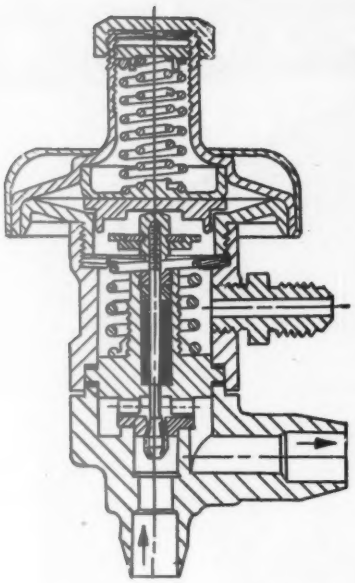
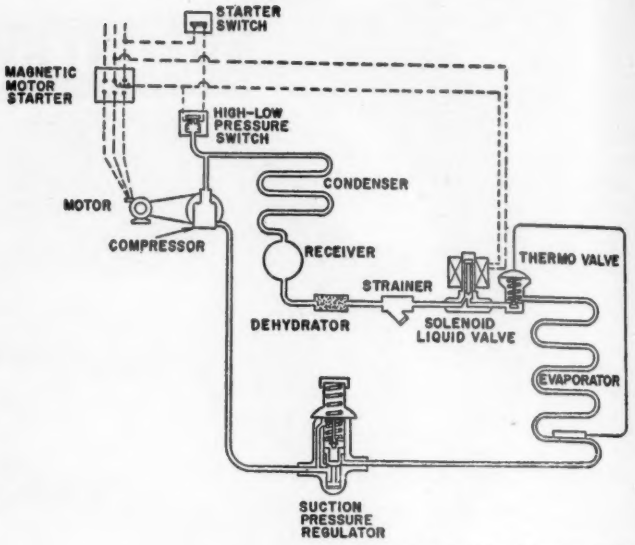


By courtesy Alco Valve Company, U.S.A.

Fig. 14.—Suction pressure regulator pilot valve with equalizer.



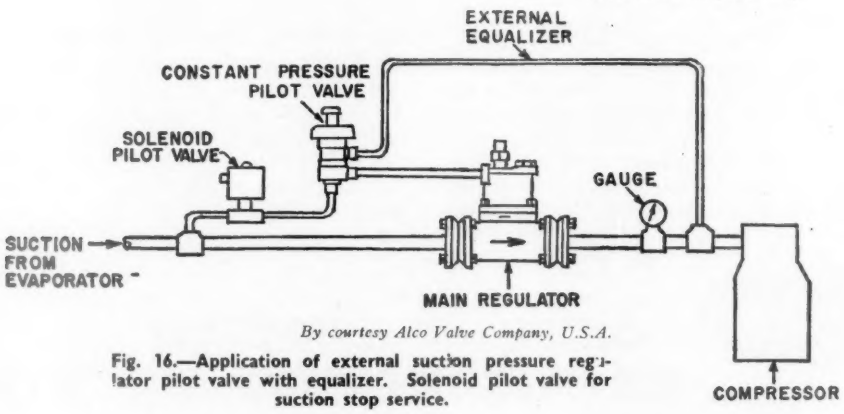
By courtesy Alco Valve Company, U.S.A.

Fig. 15.—Typical application of an internally pilot-operated suction pressure regulator.

ward load or thrust. It will be noticed in the picture that a dashpot system is attached to the piston to avoid oscillation of the valve.

The valve typified by fig. 14 is used for operating servo valves and therefore has to deal only with pilot quantities of gases. It will be seen that this valve is similar in many ways to fig. 13 type, except that it has only the small pilot seat and it does not operate by the main connexion transmitting pressure to the diaphragm, but through an equalizer line represented by the small screwed connexion in the middle of the body. The equalizer is connected downstream of the main valve to avoid pressure drop in the servo mechanism and, therefore, this type of pilot does not suffer any complications of pressure drop in pipe work and other valve gear. It will be seen that the push rod pin is a packed gland assembly, thereby isolating the pilot from the main valve pressure

(*continued on page* 619)



By courtesy Alco Valve Company, U.S.A.

Fig. 16.—Application of external suction pressure regulator pilot valve with equalizer. Solenoid pilot valve for suction stop service.

The Institute of Refrigeration Bulletin

Institute Headquarters: New Bridge Street House, New Bridge St., London, E.C.4 (CENtral 4694)

MEMBERSHIP

At the meeting of members held on May 1, 1958, the following were elected to membership of the Institute :—

Associate Members

Cockrell, John Frederick, 62, Airlie Street, Hyndland, Glasgow, W.2.

Fozzard, Cyril Albert, 3, Eversleigh Road, London, N.3.

Green, Dennis William, " Windyridge," Gidley Way, Horspath, Oxon.

*Kassar, Faraj, El Haditha Pharmacy, Baghdad, Iraq.

Strauss, Joseph George, " Apple Yard," Gatesden Road, Fetcham, Nr. Leatherhead, Surrey.

* Transfer from Graduate.

Companion

Rae, Ian Malcolm, Homelea, Wisborough Green, Billingshurst, Sussex.

Associates

Armsby, Dennis William, 38, Haydon Road, Bushey Oxhey, Herts.

O'Halloran, William Kevin, 81, Eden Park, Dundrum, Co. Dublin, Eire.

Paddy, Leslie George, 5, Holland Way, Hayes, Bromley, Kent.

Payne, William Tudor, 45, Holland Road, Hove 2, Sussex.

Tansley, Arthur Douglas, 40, Prendergast Road, Blackheath, London, S.E.3.

Turner, Herbert James, 69, Winifred Road, Coulsdon, Surrey.

Graduates

Ali, Yahya Abid, 82, Camberwell Road, London, S.E.5.

Boast, Michael Frederick George, 22, Parkfields Avenue, Wood Lane, Kingsbury, London, N.W.9.

Green, Mervyn Leonard, 260a, Preston Road, Harrow, Middlesex.

Lakdawala, Ness Rustomji, 19, Kenwyn Road, London, S.W.4.

Mojumdar, Saurendra Nath, 6, Broughton Road, Handsworth, Birmingham, 20.

INTERNATIONAL CONFERENCE ON FATIGUE OF METALS

The Proceedings of the International Conference on Fatigue of Metals, which was held in London from September 10 to 14, 1956, have now been published, price £4 10s., including postage.

Copies are obtainable from The Secretary, The Institution of Mechanical Engineers, 1, Birdcage Walk, Westminster, London, S.W.1.

Marine Insulation

" Problems of heat transfer confront investigators in every branch of engineering and in the practice of shipbuilding, one can find all types of engineering. Therefore, it follows that thermal insulation, being a specialised branch of heat transfer, must play an important part in the construction of a modern ship," said Mr. G. Laing, A.M.I.MECH.E., A.M.I.MAR.E., A.M.INST.R., in a paper read before the Institute last month.

" The scope of marine insulation is very wide and varied ranging from temperatures of -10° F. in the case of refrigerated cargo spaces to temperatures in excess of 1,000° F., in the case of engines and boilers. Recently this lower limit has been considerably reduced by developments in connection with the transport of liquid methane at -260° F.

" The demand for insulation is also magnified by the fact that it is not improbable for a dining saloon to be located in close proximity to a boiler room or a cabin located directly above a refrigerated compartment. The land equivalent of this situation would be a first-class restaurant on a balcony overhanging a power station or a hotel bedroom on top of a cold store, with the added difficulty that the walls are made of steel, which is by no means the best resistant to the flow of heat.

" It is intended in this lecture to concentrate on the applications associated directly or indirectly with the operation of refrigeration plant as follows:—

(a) Refrigerated cargo spaces;
(b) Refrigerated domestic chambers;
(c) Accommodation insulation.

(1) *Refrigerated Cargo Spaces—Materials and Methods*

Striking progress

This photograph shows
8 weeks progress on a sub-zero store of ONE MILLION c. ft. capacity.

over 8 weeks

EW TECHNIQUES CUT BUILDING TIME

using advanced methods of fabrication, whereby work can oceed apace regardless of ather, Smiths Insulations Ltd. building some of the world's gest and most efficient cold res in record time. Costs are atly reduced and completion eded up. These huge under-tings include industries concerned h fish, ice cream, meat, beer, it and food. Our 84 years' erience and wide resources ble us to offer a complete vice in the design and speedy struction of cold stores of size.

URTHER DETAILS OF HESE VAST DEVELOP-ENTS WILL BE NNOUNCED SHORTLY.

This photograph shows
8 weeks progress on a 600,000 c. ft. low temperature store

" This term refers to the tween decks or holds cooled and insulated to make them suitable for the carriage of cargo at temperatures from - 10° F. (quick frozen) to 54° F. (bananas). The insulation of the above chambers presents peculiar problems compared to land cold store insulation because of the following factors:—

(1) The structure to which the insulation is applied is not static but in motion.
(2) The boundaries forming the spaces are generally constructed of steel plating.
(3) The insulation is regularly pierced by steel frames and beams forming thermal bridges.
(4) General cargo such as locomotives or heavy vehicles may be carried on outward voyages, therefore refrigeration is not continuous.

" Perusal of the above conditions indicate that marine insulation construction must have the following characteristics—low weight combined with robustness, resistance to pounding and vibration, maximum efficiency to combat effect of steel scantlings. It should be admitted, however, that factors (2) and (4) indicate that the problem of vapour barriers are not so acute as in land cold store practice, except in special circumstances referred to later, and it may be that marine insulation contractors have made the better bargain.

" In the last fifteen years considerable changes have taken place in the materials and methods used. The changes have been bound up with:—

(1) Shortage of traditional materials during wartime.
(2) Method of cooling by air circulation, becoming more generally accepted.
(3) Development of materials with improved qualities.

" A typical section of ship's side insulation in the pre-war era consisted of granulated cork packed to a density of $6\frac{1}{2}/7\frac{1}{2}$ lb./ft.^{3} in the cavity formed with tongued and grooved lining nailed to wood grounds. The cooling was effected by brine or direct expansion grids attached to ship's sides by coachscrews and to the deck by eyebolts. This method of insulation has given and will continue to give satisfactory service, particularly if it is ensured that the timber lining is well seasoned and the cork is packed immediately the bale is broken down. The author has recently inspected two ships, one built in 1935 and the other in 1944, and noticed that the cork was dry and fresh with no sign of rotting. On some areas the natural resin had bonded the granules together to form a natural slab conforming to the shape of the steelwork.

" The non-availability of good quality timber during the late war led to the introduction of hardboard sheeting fitted to wood bearers running across the main beams or frames and the use of slag wool at 12/14 lb./ft.^{3} and glass wool at $4\frac{1}{2}/5\frac{1}{2}$ lb./ft.^{3} in lieu of granulated cork. Although the use of wood bearers running across the beams was mainly to reduce the quantity of timber necessary, it had the not inconsiderable advantage of reducing the heat leakage. Examination of the insulated structure indicates—and this has been confirmed by calculations by many authorities—that the main heat inflow to the space is due to the influence of the high conductivity of the frames and beams. It therefore follows, that any method which substitutes insulation material for timber in the area round the beams will have a favourable effect on the heat leakage.

" This has led to the development of patented rail systems which combine the characteristics of reducing the heat leakage to a minimum and reducing the erection time.

" Typical insulation specifications for vertical surfaces and deckheads now embody granulated cork, glass, or rockwool as the main insulation material lined with (*a*) Resin-bonded plywood to B.S.1088 (*b*) Corrosion-resistant marine aluminium alloy (*c*) Galvanized steel sheeting, the final choice being dictated by ability to withstand the peculiar conditions imposed by the nature of the cargo or cargoes.

" Associated with those developments, the method of cooling by forced air circulation over direct expansion or brine batteries became more general and although this had been accepted practice in the carriage of fruit cargo it was now applied to frozen meat cargoes.

" The introduction of forced air circulation raised the problem of air leakage into the insulation which was not fully appreciated initially. This has been emphasized by Lorentzen and Brendeng[7] in a paper to the International Institute of Refrigeration.

" To achieve the maximum cubic capacity, the air trunking, in many cases of three-sided construction, was buried in the insulation and too little attention paid to airtightness and sealing of joints, particularly in way of delivery and suction openings through the lining, with disastrous results as indicated in the above paper.

(This has now been overcome by adopting methods which enable all buried trunking to be four-sided with joints.)

" Deck and tank top insulation is invariably carried out in slab cork insulation and although the heat leakage problem is simplified due to the fact that it is a plain surface with no beams intruding into the insulation, the provision of a surface with good load bearing and high impact resistance suitable for general cargo, e.g. locomotives, has not yet been met.

" The author also dealt with methods of testing insulation, followed by a discussion on guarantee, domestic chambers and accommodation insulation and he outlined the expected form of future developments."

Problems solved from cold NO. 6 IN A SERIES

By Appointment to Her Majesty the Queen
Manufacturers of refrigerating machinery
Pressed Steel Company Limited

How we brought fresh air to the Old Bailey

The 200-year-old problem – hot and stuffy courtrooms

Before every new session at the Old Bailey the judge receives a nosegay as he goes into court. The tradition dates from when prisoners were so unwashed, and often so infectious, that the judge was glad of flowers under his nose. But however good flowers may be against 'gaol fever', they are no cure for fuggy courtrooms. Nor do they make wigs and gowns any cooler on hot days. So when the Old Bailey was rebuilt it was decided to install complete air-conditioning. That was the obvious, simple answer—and Prestcold were the obvious people to provide the refrigerating equipment.

THE SIMPLE ANSWER WAS NOT SO SIMPLE

But in fact nothing could have been less simple. To air-condition a building as large as the Old Bailey calls for no small amount of machinery, and storage for 5,000 gallons of water. Yet the only room for it all was in a small basement. 'Dungeon' would be a better word, for it was completely cut off from the outside world. All the equipment had to be lifted over the roof, and lowered down the old ventilation shaft by crane.

THE PRESTCOLD SOLUTION—FOUR COMPACT WR 2500s

The whole operation was possible only because the Prestcold condensing units would fit into the tiny space provided. For the Prestcold WR 2500 is extremely compact. Its compressor and motor are mounted together on a base which incorporates the water-cooled condenser. To save more space the four chilled water tanks were assembled together and insulated to form one unit. So there they are in their dungeon today—four Prestcold WR 2500s. They can be counted on to serve a long life sentence—and with good conduct taken for granted.

CAN PRESTCOLD HELP YOU ?

If you have a problem in refrigeration write to your Prestcold Distributor, or to Prestcold Commercial Sales Department, Cowley, Oxford.

FOR FRESH IDEAS...IT'S

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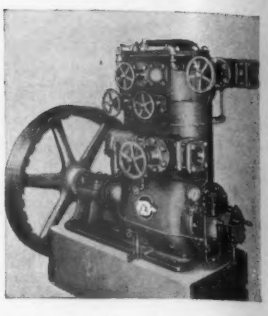
PRESSED STEEL COMPANY LIMITED, COWLEY, OXFORD

COMMERCIAL AND INDUSTRIAL SECTION

Manufacturers' and distributors' news



At the eleventh annual general meeting of **Temperature Ltd.**, held at the company's offices, Burlington Road, Fulham, London, S.W.6, Mr. D. A. McDonald, the chairman, stated that the company had recently acquired an extra 9,000 sq. ft. of factory space at their Hanworth factory to provide for further expansion during 1958. Sales for 1957 were £1,090,409. The percentage of net profit on sales after allowing for depreciation and taxation was 5·5—this ratio being approximately the same as the previous year's.

* * *

At the annual general meeting of **Turner & Newall Ltd.**, held in Manchester, with Sir Walker Shepherd presiding, it was stated that the factories of The Washington Chemical Co. Ltd. operated at high capacity throughout the year, with a sales turnover considerably in excess of that of the previous year. Increasing costs of production resulted, however, in reduced profit margins, whilst export business, although demand was strong, remained very competitive. Good progress was made with the factory modernization and enlargement schemes, whilst research work on the company's products and processes proceeded favourably. Newalls Insulation Co. Ltd. also experienced a satisfactory year, with turnover approximating to the record figures reported last year.

* * *

An interesting exhibition of refrigeration equipment was enterprisingly staged by **S. Evans & Sons Ltd.** in the Prince Albert, Maidenhead. A wide range of plant, handled by Messrs. Evans, was displayed ; this included the products of L. Sterne & Co. Ltd., Aero Pipe & Glass Co., Golden Hind Ltd., Winget Ltd., Kelvinator Ltd., Nu-Aire Ltd., L. D. Wood (Eldwood) Ltd., J. Samuel White Ltd., Parnall Ltd., Friokold Ltd., and The Smithfield Refrigerator Co. Ltd. The Hartmann Fibre Co. Ltd., gave demonstrations on prepackaging of produce ; Bowyers (Wiltshire Bacon) Ltd., displayed their cooked meats, etc., and Mudd's, Colebrook's, Fropax and Birds Eye displayed frozen food. The visitors took a great interest in the prepackaging of produce and many have decided that they will adopt this method in the future. We understand that the show was a great success both from a sales and publicity point of view, and already many sales have resulted.

* * *

Three sets (24) of Heenan closed circuit air coolers for use with three vertical water turbine alternators at Belesar, Spain, have been ordered from **Heenan & Froude Ltd.** of Worcester by the British Thomson-Houston Co. Ltd. A further order placed by B.T.-H. with Heenan & Froude is for air coolers for the propelling machinery for a number of new P. & O. liners. Other orders recently acquired by Heenan & Froude include one from the English Electric Company for three sets of closed circuit air coolers for cooling large electric motors at the Fawley plant of Monsanto Chemicals ; another on behalf of the Steel Company of Scotland Ltd., Cambuslang, for seven closed circuit air coolers and two water coolers for the rolling mill motors and generators for the Hallside Alloy Scheme ; and 12 Heenan P. 67 water coolers for the Nuclear Power Plant Co., Knutsford, Cheshire, for Bradwell Power Station. Heenan & Froude have also received a large order for air coolers from Matthews & Yates Ltd., of Swinton, for the Nangao fertilizer scheme in India.

Crane Packing Ltd. of Slough have developed solid raw material forms of polytetrafluoroethylene (PTFE) in a number of grades, eight being so far available. The term " grades " is not connotative of the quality or purity of the products, but serves to distinguish between the different properties developed in them, either by processing, or by the use of additives. Grades 7 and 8 are examples, and contain reinforcement in the form of glass fibre. This addition to the basic material virtually eliminates cold flow and imparts better heat transfer properties ; dimensional stability is also improved, and tolerances in the order of ± 0.001 in. are possible when machining these grades. The properties imparted to Grades 7 and 8 make them suitable for use as bearing surfaces such as bushes or thrust discs. These have been applied at maximum loadings of 40 p.s.i., temperatures up to 200° C., and at rubbing speeds of up to 1,000 surface ft. per minute. Crane information bulletin No. 15 contains a description of these and other grades in which PTFE raw material forms are produced. Crane Packing Ltd. is a member of the Tube Investments Ltd. Group of Companies.

* * *

Small Electric Motors Ltd., Eagle Works, Beckenham, have announced the following appointments : Mr. G. L. Brownson, B.SC.TECH., M.I.E.E., who has been works manager for 18 years, has been appointed technical director and chief engineer. Mr. K. H. Harding, who has been with the company for 11 years as sales manager, has been appointed sales director. Mr. J. A. Wilson, B.SC.TECH.(HONS.), A.M.I.E.E., who has been assistant works manager for the last 17 years, has been appointed works manager.

The latest addition to the "Metrovac" range of rotary vacuum pumps is the type DR210 comprising two single-stage, vane-type pumps mounted in a single oil tank and driven by a common shaft. The equipment, therefore, has the pumping characteristics of two single-stage pumps with considerable saving in space. The pump is in good dynamic balance, the centre lines of the sliding vanes in the two rotors being arranged mutually at right angles : vibration is therefore greatly reduced. Operational noise has been kept to a minimum by the use of a quiet type of exhaust valve assembly and helical reduction gears. Like other small rotary pumps in the "Metrovac" series, the DR210 is fitted with an oil baffle, a sight glass, gravity drain plug and a pressure drain connection on the top cover. For use in situations where a gravity draining of the pump case is impracticable, a special pressure drain attachment can be supplied.

* * *

The following appointments have been made by **Expandite Ltd.**, manufacturers of jointing materials, sealing and waterproofing compounds, Chase Road, London, N.W.10 : Mr. T. Pooley, sales director, has been appointed deputy managing director ; Mr. E. L. Townsend has been appointed to the board as director in charge of overseas developments ; Mr. J. M. Robb, manager of the overseas division, has been appointed general manager, Expandite (Australia) (Pty.) Limited, and will be taking up the post in Australia about July of this year ; Mr. J. H. Humphries has been appointed area manager Scotland, while Mr. A. W. Moignard, has been named assistant area manager for south-east England.

* * *

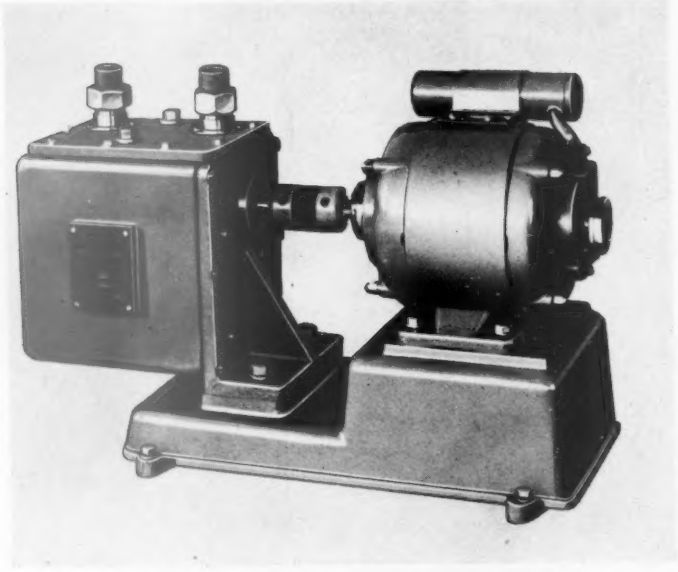
In the annual report of the directors of **Monsanto Chemicals Ltd.**, for the year 1957, it is stated that the plastics division had a year of good progress and results generally reached the targets set. "The division's principal marketing responsibilities cover our current range of plastics products, oil additives, rubber processing chemicals and the styrene butadiene copolymers sold under the brand name "Tred." It is also responsible for a range of chemicals in development and will undertake marketing of polyethylene to be produced at Fawley," states the report. "In its year's trading operations the division weathered erratic market conditions and strong competition which were evident in greater degree than we experienced in 1956. There was, however, progressive improvement through the year which ended on a strong note. . . . The year was notable for very substantial progress in the production field. Many new plants and extensions of existing plants were brought into commission at Newport and Ruabon. At Fawley excellent progress was made in the construction of our new plant for the production of polyethylene. At Ruabon a new plant for the manufacture of Santosite was commissioned and extensions to the phenol and acetyl salicylic acid (aspirin) plants were completed. Major engineering and building projects at Newport, which have been in progress over the past two years, were practically completed. During the year plants were brought into commission for the manufacture of cyclohexylamine, Santocure AW, maleic anhydride, "Tred" and continuous production of oil additives."

* * *

The rapid expansion of the company's activities overseas has made it necessary for **Evershed & Vignoles Ltd.** to open a branch office in Belgium. This office, which opened on April 1, is under the management of Mr. C. Samyn who has for a number of years handled the company's products in Belgium. The whole range of electrical instruments, instrumentation and control equipment, is now made available through this office for Belgium, Belgian Congo and the Grand Duchy of Luxemburg. Mr. Samyn is responsible to the company's overseas instrument division and international instrumentation and controls division. The address of this new office is : Evershed & Vignoles Ltd., Succursale, 142, Rue Gallait, Bruxelles.

* * *

"The Nuclear Power Station," is the title of a new booklet just published by **Wakefield-Dick Industrial Oils Ltd.** The purpose of the booklet is three-fold : first to highlight the importance to British industry of the development of nuclear power, second to explain the structure of the nuclear power industry as at present constituted, and third to illustrate the way in which a nuclear power station differs physically from a conventional



"Metrovac" rotary vacuum pumping set, type DR210.

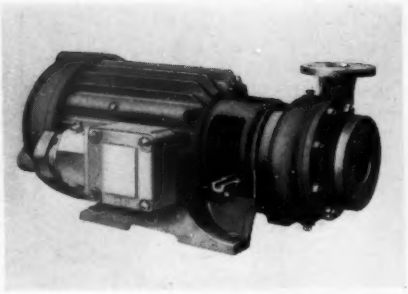
station. Wakefield-Dick are themselves closely associated with these matters as they have already been appointed suppliers of lubricants and transformer oils to several nuclear power stations. The booklet, which is most attractively produced, will be of wide interest and copies are obtainable free on request to Wakefield-Dick Industrial Oils Ltd., 67 Grosvenor Street, London, W.1.

* * *

The Lightfoot Refrigeration Co. Ltd. recently displayed at the Club Trade Fair at Park Lane House, London, a two-tier, bottle-cooling cabinet. The company has been supplying this type of bottle-cooling cabinet, operated by a remotely installed condensing unit, for sometime; however, at recent exhibitions, Lightfoot's have noted that the demand was for a portable cabinet which could be moved for cleaning purposes, or from room to room as custom demanded, which is the reason for their developing this particular model. It was received with great enthusiasm at this particular show. The cabinets are of the "dry type," the cooling plates forming shelves on which the bottles stand. This direct contact cooling is the most efficient yet devised. No water is used in these cabinets which makes them much cleaner in use, permits easier handling of the bottles and prevents soaking and resultant removal of labels. The refrigerating machine is housed in a special compartment inside the cabinet and the unit is delivered ready for connecting to an electrical supply outlet. This permits installation to be carried out with a minimum of inconvenience, and reduces installation charges. Being self-contained, the cabinets may be moved about as required, provided an adjacent electrical point is available. The cabinet can be supplied in polished veneer, oak or walnut, or in a variety of plastics to match existing decoration. Non-standard sizes can be supplied to suit special requirements.

* * *

The introduction of the "Monobloc" flameproof motor to the present successful range of Worthington-Simpson motorized units will considerably widen the field of application of this type of pumping unit particularly in the petroleum and chemical industries. The new Worthington-Simpson range of flameproof totally enclosed, fan-cooled, squirrel-cage induction motors has been designed to meet groups I and II gases and comply fully with B.S.229 : 1957 for flameproof enclosure and B.S.2613 : 1957 for electrical performance. The sizes range from 1 h.p. to 7½ h.p., 1,450 r.p.m. and 1½ h.p. to 12½ h.p., 2,900 r.p.m. In addition to maintaining the principal features of the "Monobloc" design, the motor enclosure is of substantial construction so as to withstand rough usage and the arduous conditions under which flameproof motors may be called to operate. A prototype machine has passed its Buxton test and the flameproof certificates which are issued by the Ministry of Power are in the course of preparation.



W.S. flameproof motor.

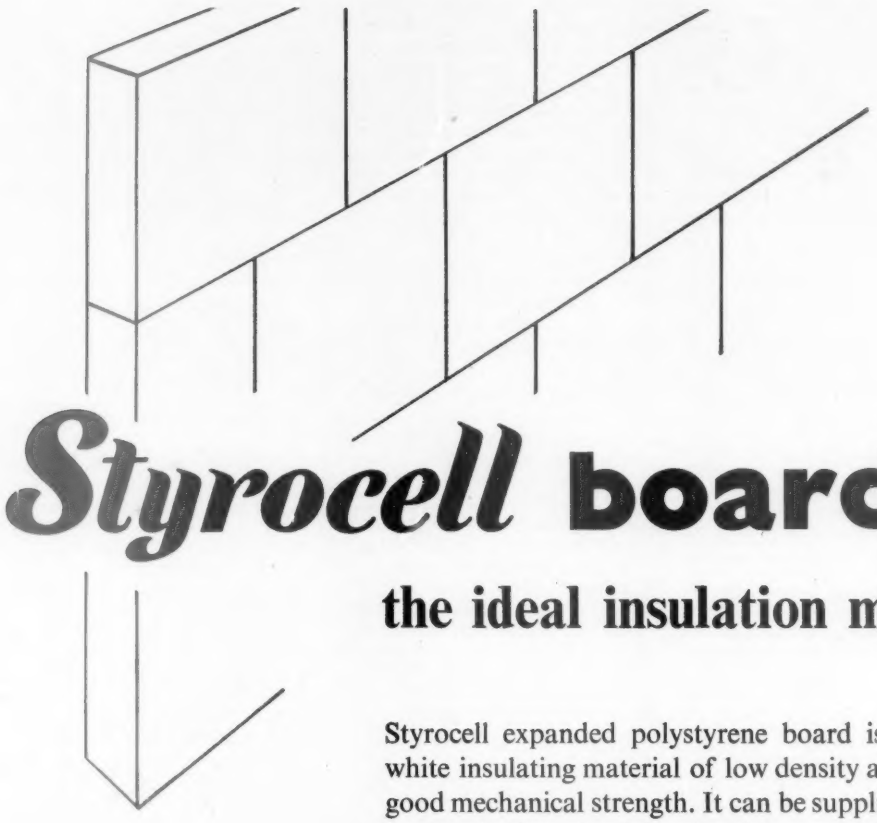
* * *

Keith Blackman Ltd. have issued new catalogues relating to their "Tornado" Type AFX axial fans, their type APA propeller fans and their type EK centrifugal fans. The contents of each of these three brochures includes full details of the relevant fan range, specification, comprehensive capacity tables, dimension drawings, fan laws and other data applicable to the particular fan type, such as wireguards, shutters, switches, starters and regulators, bearings, access doors, positions of motors and finishes.

* * *

The British public's backwardness in buying refrigerators is being investigated by a leading department store. In America 94 per cent. of the homes have refrigerators. For Sweden the figure is 52 per cent. and for Denmark 25 per cent. But in this country the figure is 10 per cent. In an attempt to find the reasons why so many people in the United Kingdom have "made do" without a refrigerator, **Hampton's** of Kensington—the well-known furnishing store—have embarked on an intriguing marketing experiment. The company has offered Kensington residents two weeks' free trial of the new LEC refrigerator. This will be installed free, and after the trial period should any resident not wish to keep his refrigerator, it will be removed free. In this case, however, it is hoped that the resident will tell the store why he does not want to keep the refrigerator. This customer-retailer co-operation is expected to yield much valuable in-

Twenty-seven dozen, twin-tier, self-contained bottle cabinet by Lightfoot.



Styrocell board

the ideal insulation material

Styrocell expanded polystyrene board is a white insulating material of low density and good mechanical strength. It can be supplied in standard and self-extinguishing grades, and in a range of densities depending on the degree of mechanical strength and thermal efficiency required (K value for material of 2 lb. per cu. ft. is 0.20 B.Th.U. at mean temperature 50°F.) Styrocell is odourless, fungus proof and contains nothing of food value to vermin. This ideal insulation material can be used up to 160°F.

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Experiment at Hampton's.

formation about a market which must surely be capable of considerable expansion, when one remembers that at present only one home in 10 has a refrigerator.

* * *

Two items of interest to those connected with machine-shop practice come from **Alfred Herbert Ltd.** of Coventry. The Herbert No. 47V vertical milling machine has proved extremely suitable for light precision operations and heavy cutting with carbides on materials ranging from aluminium to high-tensile steels. A wide speed range, comprehensive range of automatic feeds to longitudinal and transverse motions associated with an extremely sturdy spindle and bed ensures maximum efficiency within its capacity of 48 in. × 16 in. × 23 in. (1219 × 406 × 584 m/m). To increase its field of application the spindle head of the 47V can now be fitted with an automatic power down-feed unit. This new unit permits any combination of holes in the vertical plane and at five levels, to be drilled and accurately bored during the same setting as for the milling operations. This simplifies a fundamental machining practice, common in most toolrooms, of holding close tolerances between surfaces normally machined in two operations on different machines and requiring considerable skill in resetting. The second piece of news concerns the production of accurate length and depth in a longitudinal direction which is always a major difficulty in lathe work. The Ceewrite indicator has been designed to make it possible to obtain any number of lengths and depths over the whole working length of the lead screw to within limits of 0.001 in. It eliminates the use of depth micrometers, slip gauges, standard or vernier micrometers. Furthermore, no time is lost in stopping the machine for checking purposes. The method of attachment will vary according to the lathe, but a method common to many lathes will be to attach the indicator to the saddle so that it will work on the lead screw. The Indicator is particularly suitable for use on the Edgwick lathe.

* * *

Electrical Refrigeration and Radio Engineers (Epping) Ltd. of 35, Little Russell Street, London, W.C.1, have issued an interesting booklet called "Service," explaining the comprehensive facilities that they offer in the field of maintenance of either large or small plants—24 hours a day throughout the year. A clever idea of this firm is the issuing of a gummed label bearing their name, address and telephone number which users are asked to affix to the inside of the cabinet, thus assuring them quick service, if in trouble, by a 'phone call.

* * *

That well-known finance organisation, **United Dominions Trust Ltd.**, have secured additional offices at 29 Pall Mall, London, S.W.1. (TRA. 2672/3) in order to provide a convenient meeting-place in the West End for those who have credit finance proposals to discuss with the company, and who may not always find it easy, London traffic being what it is, to visit United Dominions House in the City of London. The offices have been constructed in and around what was formerly the swimming pool of the ladies' section of the Junior Carlton Club. They consist, on the lower floor, of a reception office and two discussion rooms, and on the upper floor, of a large meeting room. Mr. J. S. Colchester will be in charge of the new office. Architects were C. S. Epril, F.R.I.B.A., and Associates at 55, Pall Mall.

* * *

A new **Easiclene** bottle cooler is called the "Polar Chest" and will hold six dozen lagers and two dozen baby minerals. In addition it provides ice cubes. The all-steel, stove-enamelled cabinet has a one-piece moulded polystyrene interior fitted with plastic covered steel bottle racks. The evaporator provides ice-making facilities, and is complete with quick-release ice-tray producing 18 cubes. The refrigerating unit, guaranteed for five years, is operated by a ⅛ h.p. hermetically sealed refrigerating system protected by thermal overload relay. Voltage range is 100/250 volts a.c., 40/60 cycles. Price is £54. Dimensions are: height, 35¼ in. width, 24 in. and depth, 25 in.

* * *

In our photographic record last month of the B.R.A. luncheon, the names of the gentlemen in picture 7, page 477, should have read :—Mr. J. T. Herbert, Mr. E. Lefre, Mr. H. R. Chuter and Mr. A. H. Fuller. Our apologies are extended to Colonel Fuller, managing director, Metropolitan Refrigeration Ltd., well known in the industry.

* * *

A coloured scale model of the new Welsh commercial television station, Pontcanna Farm Studios, made in ice cream, was a feature of a lunch given at Sophia Gardens Pavilion, Cardiff, to 150 business men from South Wales and the West of England recently. The lunch was given by the contractors of the new station, T.W.W. Ltd. Made by **Lyons Maid** at their Cadby Hall, London, factory, the model took two craftsmen three days to make. It was 2 ft. square and 6 in. high, made in Hostess vanilla ice cream, sprayed and piped with coloured cream.

MOULDED IN LUSTREX

Refrigerator butter dishes moulded in Lustrex by Fraser & Glass Limited for the Pressed Steel Company Limited

Lustrex polystyrene has grades for every purpose: *for toughness*—and extra-toughness . . . Lustrex Toughened 3 and Toughened 11 • *for vacuum-forming*—Lustrex Toughened 6 for sheet extrusion • *for intricate mouldings*—especially those needing a long flow . . . Lustrex Hi-Flow 55 • *for dry colouring*—to any shade you require . . . Lustrex Colourant Blend • *for almost any job in polystyrene* . . . Lustrex General Purpose. *Lustrex is a Registered Trade Mark.*

We also welcome your enquiries for the following imported product which is manufactured by Monsanto Chemical Company, U.S.A.

Santocel A for Thermal Insulation.

1. *High Thermal Efficiency*—K Factor (mean temp. 60 F.) 0.150 BTU/Hr./ft.²/in./°F.
2. *Free Flowing Properties*—simplifies the filling of irregular spaces.
3. *Versatile*—saves space and is ideal for both high and low temperature work.

MONSANTO
Regd.

MONSANTO CHEMICALS LIMITED, Plastics Division,

355 Monsanto House, Victoria St., London, S.W.1 and at Royal Exchange, Manchester, 2.

In association with: Monsanto Chemical Company, St. Louis, U.S.A. Monsanto Canada Limited, Montreal. Monsanto Chemicals (Australia) Ltd., Melbourne. Monsanto Chemicals of India Private Ltd., Bombay. Representatives in the world's principal cities.

MARKET REPORT ON AIR-CONDITIONING PLANT IN CEYLON

PREPARED by the United Kingdom trade commissioner at Colombo, a market report on air-conditioning in Ceylon states that the rates of import duty in Ceylon on domestic and packaged units of air-conditioning equipment were more than trebled as from July 4, 1957. Tariff rates are now :—

	Preferential rate, ad valorem, *per cent.*	*General rate*, ad valorem, *per cent.*
Machines, self-contained air-conditioning, comprising elements for cooling, controlling humidity, cleaning and circulating air :—		
Complete	105	110
Parts	100	110

Rate of exchange, 1 rupee = 1s. 6 $\frac{5}{32}$d. to 1s. 6 $\frac{5}{32}$d.

Industrial plant is classified for duty purposes as machinery and attracts duty at 17½% (preferential rate) and 27½% (general) but to qualify for this reduced rate, the entire machinery must be imported in its component parts, completely assembled in Ceylon and must be used for purposes other than human comfort. Central plant which, although made up locally in some cases, is assembled from units which are, in themselves, self-contained when imported (*e.g.* refrigeration units) does not therefore qualify for this lower rate. In this connexion, however, it should be noted that because the trade is of relatively recent origin, no specific tariff rating has been provided for central plant and the customs authorities are tending to treat individual shipments on their merits. It is, however, clear that any equipment intended only for human comfort is charged at the highest rate.

In accordance with the Government's policy towards the country's industrial development, a special nominal rate of duty of 2½% (preferential) and 12½% (general) has been provided for "machinery for essential industrial development." For industrial air-conditioning plant to qualify for this tariff rating, prior ministerial approval would have to be obtained. Two overseas pharmaceutical manufacturers, who have recently constructed air-conditioned factories in Ceylon for local production, have secured the concession of this nominal import duty rate for the air-conditioning plant installed in the factory premises.

Import Restrictions

The only restrictions on the import of air-conditioning equipment into Ceylon are :—

(1) Consignments from Japan, Germany, Austria, Yugoslavia, Czechoslovakia and Poland may be imported only by registered Ceylonese traders.

(2) Licences, which are issued at the discretion of the import controller only to registered Ceylonese traders, are required for supplies from China, Spain, U.S.S.R., Albania, Bulgaria, Estonia, Hungary, Latvia, Lithuania, Roumania and Formosa.

Government Regulations and Standards

There are no quotas, sales taxes, price ceilings, turnover restrictions, regulation of profits or any other form of control over the sale of air-conditioning equipment in Ceylon.

There are no standards to which imported equipment is required to conform, but the Government electrical department are tending recently to apply A.S.R.E. standards for equipment installed on government contracts.

Electricity supply in Ceylon is 400/230-volt, A.C., three-phase, 50-cycle current and 440/220 D.C. Of the several electrical tariff rates offered, some are applicable to users of domestic and central air-conditioning plant.

Precise statistics of the import of air-conditioning equipment into Ceylon are not available as the figures for such equipment in the official published returns include those for refrigerating machinery. It is estimated, however, that total imports of air-conditioning equipment (almost entirely from the United States) have been valued at some £65,000 annually during the last three years.

There is no local production of air-conditioning equipment in Ceylon, although some of the firms handling central plant assemble the evaporative condensers, refrigeration units and other components in their workshops.

The Market

Although in the extent to which air-conditioning is enjoyed Ceylon lags behind many other countries with similar climatic and economic conditions, there has been a substantial increase in the number of installations in recent years and several firms have taken on agencies for domestic models.

Prior to the 1957 budget (when self-contained air-conditioners were dutiable at 25 per cent. preferential rate and 30 per cent. general), the installation programmes of the principal dealers implied anticipated annual sales of domestic units to a total capacity of about 400 tons. The heavy increase imposed in the 1957 budget has, however, curtailed business severely, although it is probably only a temporary slackening until prospective customers become accustomed to the higher prices. For central plant the extent of the market is estimated at about 700 tons capacity annually. Opportunities are expected shortly to occur for substantial installations in two cinemas, two banks, several large office blocks and hospitals and a Government office (the survey department). In the absence of any large-scale industry in the territory, the prospects for industrial plant are not encouraging ; in fact the only installation planned for the immediate future is at the station building and turbine room at a new thermal electricity plant to be erected within the next three years.

(a) Floor, Window and Packaged Units

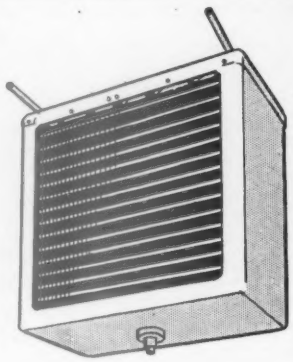
It is, no doubt, common knowledge that United States manufacturers monopolise the Ceylon market for domestic air-conditioning equipment ; no British models are on sale. Several of the important dealers have expressed their interest in handling British equipment if quality and performance comparable to American standards can be assured. Brown & Co. Ltd., a leading European firm of estate suppliers and electrical and mechanical engineers, are particularly anxious to undertake an agency on behalf of a United Kingdom manufacturer.

The largest share of the business in Ceylon is done by Carrier Corporation (U.S.A.) whose agents are Walker, Sons & Co. Ltd. It is estimated that, until a year ago, this concern secured 90% of all business in domestic equipment in this market but, with the recent increase in the number of agencies, their share is now down to about 50 per cent. To counteract the price rise due to the 1957 budget, Carrier Corporation modified their 1-h.p. window model (hitherto retailed by the agents at Rs. 3,000) by welding the unit, instead of bolting as previously, so that despite the heavy duty increase, it is now retailing at Rs. 3,500. The floor models of 1 h.p. and 1½ h.p. incorporating single-speed fan, thermostatic temperature control and humidity control sell at Rs. 4,175 and Rs. 5,700 respectively.

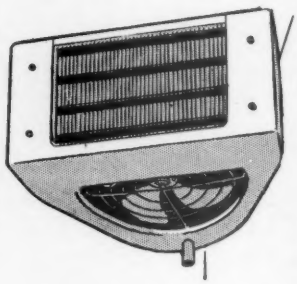
The remaining half of the business is now shared by the following American manufacturers who offer equipments

(Continued on p. 632)

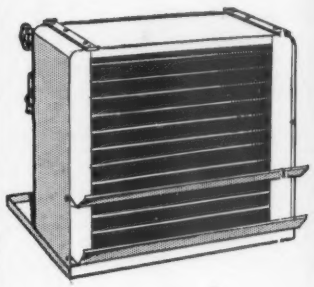
Kelvinator
have all the answers



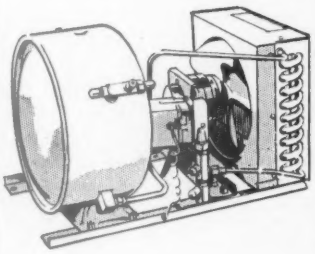
LTE COOLERS



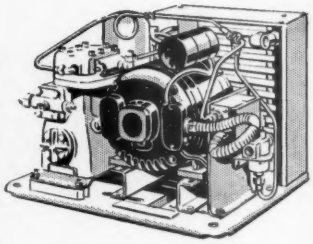
CFC COOLERS



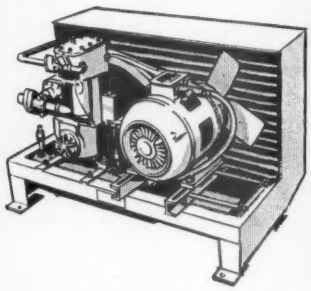
PACEMAKER COOLER



SEALED CONDENSING UNITS



WATER COOLED CONDENSING UNITS



AIR COOLED CONDENSING UNITS

We've been in the refrigeration business now for more than 40 years —but our real business is helping you to profit by our experience. Send off the coupon and we'll be pleased to show you how to go about it.

Kelvinator
FINEST MODERN REFRIGERATION

TO: KELVINATOR LTD.,
GREAT WEST ROAD, LONDON, W.4.
Please send me details of the above units.

NAME .....

ADDRESS .....

.....

.....

I am particularly interested in
COOLERS/CONDENSING UNITS MR 3

SHOP REFRIGERATION NEWS

ONE HUNDRED YEARS IN RETAIL TRADE

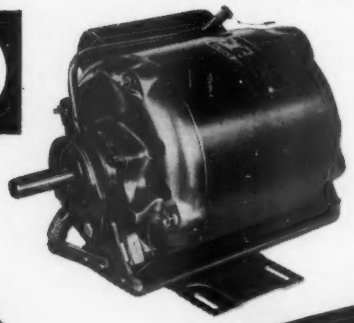
The Prestcold 16 ft. frozen food case with refrigerated canopy at Joseph Burton & Sons Ltd., Nottingham.
(Story overleaf)

a good product *starts* with a

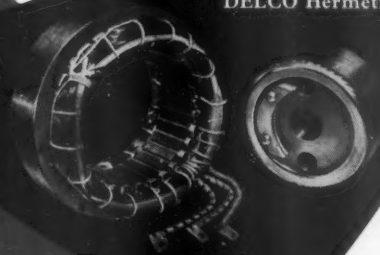
DELCO

electric motor

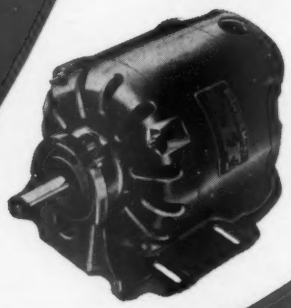
DELCO 650 Type



DELCO Hermetic Unit



DELCO 625 Type



DELCO REGD TRADE MARK

Before you start work on your plans for refrigeration applications which call for compact, high-efficiency electric motors . . . consult Delco Motor engineers.

The Delco range includes motors to meet most modern requirements. These versatile motors are so designed as to be easily adapted to suit your individual needs.

Write for descriptive leaflet featuring motors for use in :—
REFRIGERATION · AIR CONDITIONING
TEMPERATURE CONTROL

Millions of Delco Motors provide reliable power for domestic and industrial applications throughout the world.

AC-Delco
QUALITY PRODUCTS

AC-DELCO DIVISION OF GENERAL MOTORS LTD
DUNSTABLE · SOUTHAMPTON · LIVERPOOL

THIS year, one of Britain's major grocery and provision merchants, Joseph Burton & Sons Ltd., celebrate their centenary. The founder, Joseph Burton, opened a small grocery shop in Smithy Row, Nottingham, and from the very beginning built up a reputation for quality. To-day, the company has very many trading premises throughout the country, catering for every food requirement and still maintaining its high standards.

Although they are an old-established firm however, Burton's are certainly not old-fashioned in their outlook, and are constantly making improvements to their many fine premises. Just recently, four of their larger branches had new refrigeration equipment installed by Prestcold distributors, E. Helliwell (Refrigeration) Ltd. Approximately 200 ft. run of Prestcold Parade cases was supplied, giving each branch refrigeration for a comprehensive range of foodstuffs. At the Beeston, Nottinghamshire, store for instance, an 8 ft. Parade double-sided case, a 32 ft. run consisting of a 16 ft. provisions case with a 16 ft. fresh-meat case and two frozen food cases were installed. In addition a 350 c.ft. provisions coldroom, a 200 c.ft. fruit and vegetable coldroom and a 60 c.ft., fresh-meat cabinet were supplied—an impressive total.

The Smithy Row, Nottingham, store is equally well catered for ; the frozen food department has a 16 ft. Prestcold Parade case with refrigerated canopy, a 12 ft. × 6 ft. frozen food island site model, and a further wall-fitting 6 ft. frozen food case. Meat is looked after by a 20 ft. fresh-meat case supported by a 100 c.ft. cabinet, while cheese, provisions and bacon each have their own separate display cases.

Woolworth's New Food Section at Harlow

IN the store opened by Messrs. F. W. Woolworth & Co. Ltd. at Harlow New Town, Essex, the food section presents a most imposing sight.

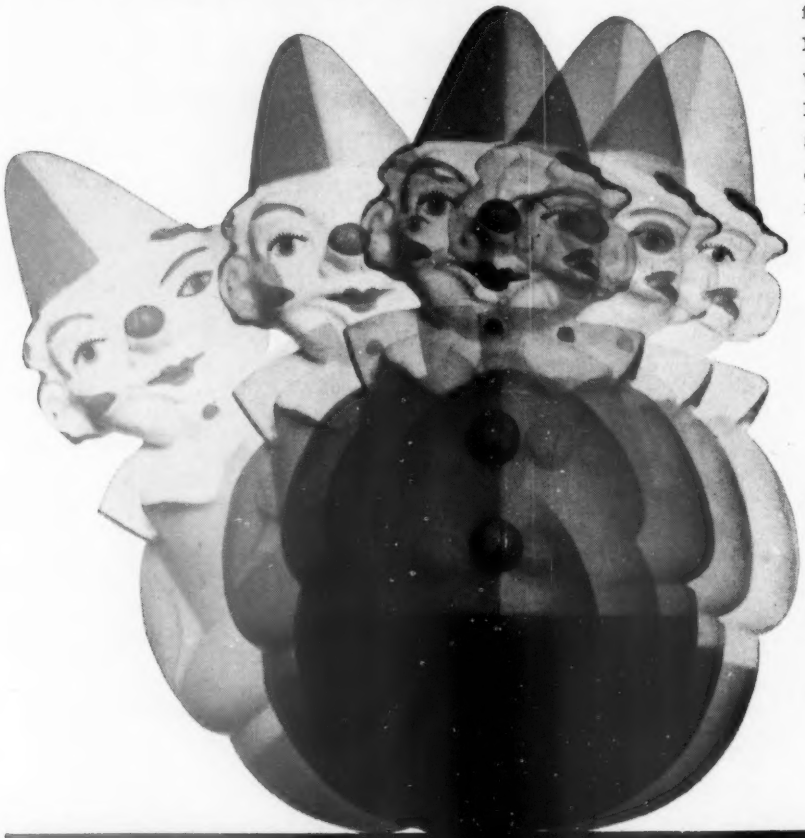
For the display and storage of this wide variety of merchandise Marco refrigerated display equipment was chosen.

The models selected were two 8 ft. " Majestic " cabinets for frozen food with a refrigerated shelf on the superstructure suitable for the display of butter and fats. Two special 8 ft. " open top " display and store cabinets for fresh meats, poultry and eggs, and two specially constructed 12 ft.

The two Marco "Majestic" cabinets in position, with frozen food in the low temperature section, and butter and fats in the medium temperature display.

Rocksil is *resilient* too

ROCKSIL—for either hot or cold insulation—has many important advantages to offer. Probably the most outstanding is its combination of strength with resilience—'rigid' resilience that absorbs impact and stands up well to considerable deflection of the surface it is protecting. In bonded slab form of various thicknesses and densities this makes Rocksil ideal for casing and structural insulation. It will not settle under continuous vibration even as loose infill. Rocksil is produced from natural Scottish rock and is odourless, chemically inert and sulphur-free, non-hygroscopic and rot-proof.



Rocksil Regd. ROCK WOOL INSULATION
MANUFACTURED AT STIRLING, SCOTLAND

Full information available from the manufacturers:
THE CAPE ASBESTOS COMPANY LTD.
114 & 116 Park St., London, W.1 Tel: GROsvenor 6022
and at:
Glasgow: Eagle Buildings, 217 Bothwell St., Glasgow, C.2 Tel: Central 2175

Manchester: Floor D, National Buildings, St. Mary's Parsonage, Manchester 3 Tel: Deansgate 6016-7-8
Birmingham: 11 Waterloo St., Birmingham 2 Tel: Midland 6565-6-7
Newcastle: 19 & 20 Exchange Buildings, Newcastle-upon-Tyne Tel: Newcastle 20488

A general view of the Marco display cabinets installed in F. W. Woolworth's new store at Harlow.

"open top" cabinets for cooked meats and provisions, etc., complete the line-up.

All cabinets are fitted with canopies containing mirrors and fluorescent lighting, the top shelves being used to display a wide selection of tinned or bottled produce. The cabinets, (low and medium temperature models having the same outward appearance), are provided with either sliding or car-type doors for ease of access. The entire section is set against one wall, and the cabinets are interspersed with cash registers and meat slicers (the stands for which were also made by Marco).

The condensing unit in all the cabinets is the famous Marco "Serviseal" unit.

The installation of this equipment was carried out by Refrigeration & Electrical Appliances, Leigh-on-Sea, distributors of Marco refrigerators.

New Refrigerated Window

ALL who sell food will agree that protection of some sort or another is absolutely essential for their goods ; indeed, under the Food and Drugs Act it is imperative, and today it is recognized that the most suitable for perishable foods is that given by refrigeration. During the early days of refrigeration one of the greatest drawbacks to the shopkeeper was that he could not display his wares to the best advantage if they were kept in a coldroom ; with the constant advances being made however, the retailer is now provided with refrigerated showcases and similar equipment, and these are accepted as essential items for the enterprising shop.

In association with the refrigerated showcase and counter, the logical link is the refrigeration of complete windows, which are being used with success all over the country. Recently a Wisbech, Cambs. butcher decided that when his shopfront was renovated, his window should be refrigerated so that meat could be shown to the best advantage whilst conforming to the new Food Hygiene Regulations. This go-ahead firm, E. L. Rose & Sons Ltd., contacted the Prestcold distributors for that area, Bedford Refrigeration Co. Ltd., who have considerable experience in this field, and within almost one week of use the first refrigerated window in the district was arousing considerable interest and more important, promoting sales !

The window was specially constructed and a number of glass panels, with spaces between them, provide the necessary insulation and help to ensure that the temperature in the totally enclosed window is not affected by outside variations. The Prestcold Super-Presmetic refrigeration unit provides a forced flow of cold air, keeping an automatic temperature of about 34° F. This unit is very silent and incorporates the Prestcold "Defrostermatic" automatic defrosting equipment, which means that no attention need be paid to it by the busy staff.

E. L. Rose & Sons have also a Prestcold three-quarter vision refrigerated counter, and a newly installed Prestcold Promoter sales cabinet for frozen foods. This is surely a butchery business where customers can select and purchase their meat with confidence, knowing that everything they buy, is kept in the most hygienic way possible by the most modern of refrigeration equipment.

The exterior of the Prestcold equipped refrigerated window at E. L. Rose & Son Ltd., Wisbech.

Revolving Refrigerated Display

IT is a proven fact that an animated display is an aid to retail selling. This knowledge, together with the appreciation that a customer never likes walking more than necessary, has been used to good effect in the production of a new shop refrigerated display slab, the " Rotosell."

This piece of equipment, which can be used for fish, meat, delicatessen items, etc., has been designed (patents are pending) by Mr. W. R. A. Happle, of 14, Weld Road, Southport.

The " Rotosell," as can be seen from the accompanying photograph of the prototype (successfully installed in Liverpool during March, 1958), is quite different in design from any conventional pattern known to exist at the present time. Efficient in performance, it also has very considerable sales appeal.

The " Rotosell " has the advantages of saving the operator's time in dressing, serving, clearing and cleaning ; and in addition, the choice of materials used in its construction ensures that the display is equally attractive when it is cleared as it is when in use. Furthermore, time-switches are fitted to control the rotation, lighting and refrigeration, separately, so that it is possible to leave the display rotating and/or illuminated at night, and also for the refrigeration to be switched off completely at closing time and to be switched on automatically at a predetermined time in the morning before the shop opens.

The display rotates automatically at a fairly slow speed—about two revolutions per minute—but can be easily stopped and restarted by means of two pairs of switches which can be positioned as required, on any part of the perimeter and at either knee or foot level. So far as fish is concerned, however, it has been found unnecessary in practice to stop the rotation except when serving small items such as prawns or shrimps which take a little time to gather in quantity.

The sloping display surfaces, on both tiers, are of ½-in white glass, which is a most attractive and hygienic surface, but specially shaped plastic trays are available as an alternative, or as an extra should these be preferred.

The vertical surfaces on the display and the lighting canopy and stem are all of white enamelled metal or plywood ; the counter-guards, or risers, are of ¼-in. curved glass and the plinth is of black rubber (or of hard-wearing " lino " for butchers' shops).

The base has a stout wood frame to which is bolted a specially designed metal structure giving added rigidity and supporting the centre shaft bearings, while the two-tier shelf assembly is built over a strong, but light, tubular frame.

REFRIGERATION CONTROLS

(*Continued from page 598*)

drop and ensuring that the valve responds only to the equalizer line pressure.

In describing the details of these various types of valves the principal operating characteristics become quite apparent. However, it should be emphasized that these controls do not merely go from closed to open positions, but have a definite throttling range and therefore meter evaporator vapour gradually into the compressor until the pressure is reduced and suction pipe and evaporator pressure are common within the limits of pressure drop and pipe work. In the majority of applications the valve will close on stopping the compressor and this, of course, will also depend upon the set point, but as soon as the compressor is started it will reopen. Under any other condition where the evaporator pressure is increased the valve will throttle, thereby controlling the load to the compressor until the evaporator pressure falls, either through change of temperature and/or the suction of the compressor.

Application (figs. 15 and 16)

The need for this type of valve is associated with suction pressure acting as an overload condition on the compressor and hence the motor, which can reach overload or even burn-out condition. To some extent protection of the motor has, or can be, accomplished by the use of expansion valves, particularly constant pressure and some thermostatic types. Conditions requiring suction pressure regulators are :—

(1) High starting load—this may occur in a machine where the natural conditions under which the machine is operating gives a high load, *e.g.*, prolonged shut-down, special cases where a fast pull-down is essential and suitable expansion valves are chosen, but motor overload is to be avoided.

(2) Surges in suction pressure, due to the operation of the machine, or the way in which the thermal load is being applied.

(3) High suction pressure by defrosting, particularly hot-gas methods.

(4) Prolonged operation and excessive suction pressures, again due to conditions, or the way in which the load is being applied.

(5) Where high suction pressure low-voltage conditions may coincide, giving a difficult condition for the motor.

Suction pressure regulators should normally be selected for required capacity at the lowest pressure drop across the valve to achieve economical compressor operation, since pressure drop in suction can represent such a high penalty in machine capacity. On the other hand, it should not be assumed that an over-sized valve will be perfectly satisfactory because it will give a low pressure drop; such a choice may produce a hunting condition and completely upset the control of the refrigeration machine. Installation of these valves in the suction pipe work does not call for any special condition, but in setting the valve special care should be given to ensuring that the closed point setting of the valve is high enough to give a fully open valve under normal running conditions.

Trouble Shooting

Symptoms	*Remedy*
High pressure drop across valve and loss of plant capacity	Valve under-size, check manufacturer's capacity data and select another valve. If capacity correct, close point set too near operating pressure, reset valve at higher close point. With internal or external servo types check for blocked port-ways, dirt or seized piston. Clear and install filter.
Noisy operation	Valve chatter, check capacity and replace if valve over size. Ascertain damping device of valve head still operative.
Erratic control or hunting	Over-size valve, check capacity and install correct size. Defective valve or pilot, replace. Dirt in control particularly servo types, clean and install filters if not fitted.
Pressure build-up in suction pipe during off cycle	Valve leaking. Check dirt on seat clean and check filters. Worn valve or seat. Replace.

(*to be continued*)

Royal Mail Lines Limited announce with regret that Mr. A. Lawrence has resigned his position as managing director owing to ill health. Mr. Lawrence retired from the board on May 31, 1958. Mr. H. Leslie Bowes, C.B.E., has been appointed managing director as from June 1. Mr. Bowes will remain a managing director of the Pacific Steam Navigation Company of which company Mr. A. E. Molyneux has also been appointed a managing director. Mr. H. J. Wheadon, M.I.MECH.E., M.I.MAR.E., M.I.N.A., M.I.E.S., M.INST.R., has now been appointed chief superintendent engineer in charge of the technical departments of both Royal Mail Lines Limited and The Pacific Steam Navigation Company.

* * *

The new deep-freezing fish and vegetable factory owned by Gael Linn, at Carna, Co. Galway, is expected to be in commission by August. The lobster pond which will hold 5,000 lobsters will be ready in June. The factory cost £30,000 to erect. Gael Linn spokesmen say the firm has made a survey of lobster and crayfish markets and has secured markets in Britain, Germany and Switzerland.

Frozen Stiff ?

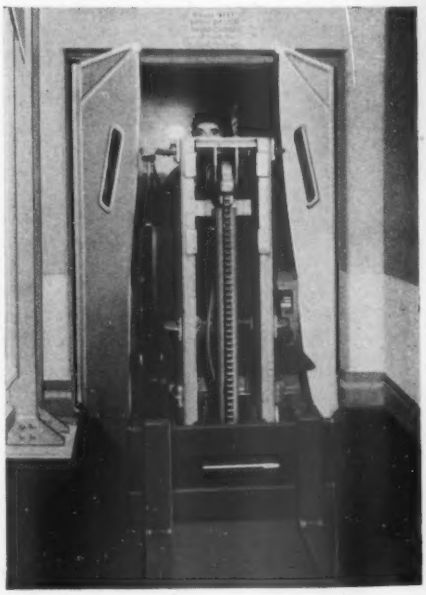
not Neway Flexible Doors

Neway Doors give efficient service in all temperatures down to – 35° F. Flexible doors are used in cold storage rooms to prevent warm air entering through the opening and condensing on the cooling pipes. The doors are invariably fitted immediately inside the insulated door, which can then be left open during the loading or unloading of the cold room without fear of the temperature of the cold room rising unduly. Neway doors are safe. The rubber panels, which are specially designed for the doors by the Dunlop Rubber Co., are flexible and yet close tight enough to seal out draughts and noise. When fitted there is no fear of crushed fingers or other accidents. Easily installed in existing frames they can be made to fit any size opening. Once fitted little or no maintenance is ever needed. Neway Doors have already been fitted in the cold storage rooms of many leading firms, including J. Lyons & Co. Ltd., and Birds Eye Foods Ltd.

Rubber panels by
DUNLOP
Rubber Co., Ltd.

✱ See Neway Flexible Rubber Doors at the Building Centre, 26 Store Street, London, W.C.1, or write for free leaflet to William Newman & Sons Ltd., Dept. RI 9, Hospital Street, Birmingham 19.

NEWAY
Rubber Doors



By courtesy of J. Lyons & Co. Ltd.

WILLIAM NEWMAN & SONS LTD., Dept. RI 9, Hospital Street, Birmingham, 19

(*Continued from page* 574)

ings, of which each phase supplies two motors. Protection fuses for the electrical circuits, alternators, and the four motor condensers, are housed

Interior view of Interfrigo wagon showing the ice bunker doors open.

in an external casing at one end of the wagon.

An " on-off " lever control for the ventilation system—sealed in the " on " position when loaded —is fitted at each side of the wagon. The operation of the equipment may be checked before loading by rotating an adjacent crank handle.

Refrigeration of the contents before despatch is carried out after icing and loading the wagon, by connecting the fan motors to the mains supply through a special plug-adaptor.

* * *

4—Ice Cream Vehicles

The first of 20 refrigerated vehicles at present being produced for J. Lyons & Co., Ltd., by Mann Egerton & Co., Ltd., of Norwich, are pictured in the next column.

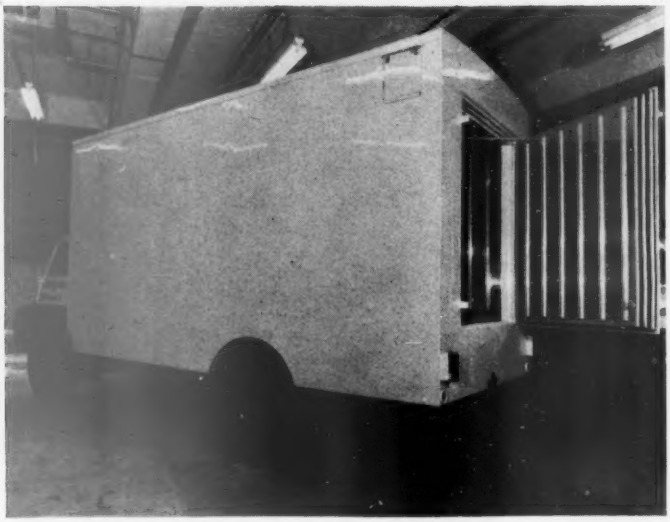
The body is constructed with hardwood framing and is integral with the cab. The insulation material used is 4-in.-thick Isocolor for the floors and walls, with 5-in.-thick Isocolor for the roof. Two flush-fitting doors are located on the near-side of the body with one at the off-side and one at the rear. The refrigeration unit is mounted on the off-side of the body below floor level.

* * *

Frozen Foods Carrier

The photograph on page 622 shows a view of the insulated and refrigerated body built by Bonallack & Sons Ltd. on a Bedford six-ton forward control vehicle. The door is 4 ft. wide and 5 ft. 6 ins. high and is fitted with retainer to hold it open at 90 degrees. It has been put into service recently by J. Spurling Limited, haulage contractors.

REFRIGERATED ROAD TRANSPORT



The refrigerated vehicle, operated by J. Spurling Limited, referred to on the previous page.

ICE-CREAM FIRM PLANS BIGGER PAYLOADS

One of the most successful answers to the problem of space and weight is this new articulated six-wheeler for bulk transport of Wall's ice cream, 26 of which are now going on the road for the first time. The trailer of the " 1,440 Canner," which Wall's themselves designed, increases the payload by 120 2-gal. cans of ice cream, with an increase in height of only 1 ft. To meet growing demand for products heavier than ice cream, such as iced lollies and water ices, the new vehicle can carry 11 tons in its three insulated compartments cooled by dry ice and yet comes well within the statutory limit of 20 tons road weight. Except for three Commer tractors, the prime movers are Bedford tractors with Leyland 0350 diesel engines and all have two-speed axles. The cabs are fitted with radios and heaters. The coachwork of the trailer is by Hooper.

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IN COIL OR CUT LENGTHS

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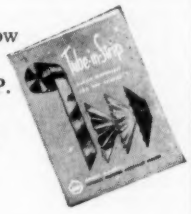
You'll want to know more about TUBE-IN-STRIP. Write to us for descriptive leaflet.



ICI METALS DIVISION

IMPERIAL CHEMICAL INDUSTRIES LIMITED, LONDON, S.W.1

C.17

5—REFRIGERATED LORRY FOR GHANA

After spending several days on test in a tropical chamber in this country, an Albion Clydesdale fully-refrigerated van has just been shipped to Ghana where it will be used to carry highly perishable foods after they are unloaded from ships docking at Takoradi. Duramin Engineering Co. Ltd. built the van body which has refrigeration equipment by Frigidaire. The body is divided into two compartments. The smaller one, which is about one-third the total capacity, is maintained at from 0° to minus 5° F. Winget Dole plates are used in the refrigeration system and there is a separate compressor installed on the body for charging the plates in each compartment. The body itself is insulated with 6 in. of Jablite insulation. It is designed to operate in an ambient temperature of 80° to 90° F. and under these conditions a " hold-over " of up to 25 hours is expected.

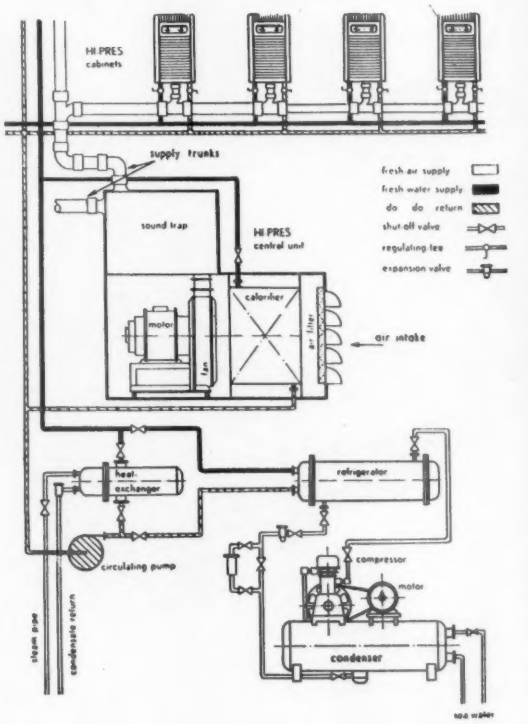
* * *

6—NEW SHIPBOARD AIR-CONDITIONING SYSTEM

THE turbine cargo liner *Queensville*, built by Lithgows Ltd., Port Glasgow, for A. F. Klaveness A/S., of Norway, is the first ship to be fitted with a Colvin-Smith Hi-Pres ventilating system.

The components of a Hi-Pres installation are : (1) the central unit in which the fresh air is conditioned and the fan is housed ; (2) the pipe system, consisting of smal pipes through which the fresh air flows to the rooms that are to be conditioned ; and (3) the cabinets which are installed in those spaces and into which the fresh air is blown. Two different cooling principles can be used ; in either case the main components are the same. With cabinet cooling the air cooling takes place partly in the cabinets and partly in the central unit. The cooling medium is fresh water circulated by means of a pump through a system of insulated pipes from the refrigerator plant to the central unit and cabinets. As the cooling causes water to condense in the cabinet it is necessary to provide the latter with a drain. This system, it is claimed, gives exceedingly good working economy, requires a minimum of cooling capacity, and provides ideal conditions in the rooms. The other principle depends on fresh air cooling and humidifying in the central unit only. The cooling is so adjusted that the cooling load of the rooms is equalized by the cooled air. The cooling coil in the central unit operates through direct expansion of " Freon " or through the use of brine as a cooling medium. A plant of this type is low priced and simple and has proved to give excellent results in a great number of ships, irrespective of whether the heating is done electrically or by means of hot water. The fresh air is conditioned in the central unit, which may be placed on the open deck or in a special fan room, and contains a filter, heating/cooling coils, fan, and sound trap. A single central unit can be adapted to different capacities and may supply up to about 40 cabinets. The use of sound-absorbing materials and dampers secures silent operation. Plants employing cabinet cooling use the coils for cooling as well as for heating, fresh water being the primary medium. This will not give rise to corrosion and as the temperature of the water never falls below freezing point there will be no trouble from ice formation. For cold-climate ships where heating only is applied, the medium may be steam or electricity. One of the principal advantages of the system is the reduced area of the ducting. The small size of the circular pipes makes the installation much simpler due to the considerably smaller demand upon space. The system is composed of smooth, welded steel pipes, galvanized inside and outside, with a wall thickness of from 1·6 to about 2·5 mm. Only four pipe sizes are used, with approximate outside diameters of 45, 65, 85 and 110 mm. The individual pipes are jointed with special sleeves which have a packing ring of non-inflammable rubber, to secure air-tight connexions and provide sound insulation between the various parts.

General arrangement of a typical heating/cooling system.



The Storage of Salk Vaccine

THE importing of salk type polio vaccine into this country has been given much publicity and the part played by the refrigeration equipment involved in the storage of the vaccine when received from Canada will probably be of interest to readers.

This salk type polio vaccine normally arrives at Manchester or Liverpool Airport and is collected by Evans Medical Supplies Limited, Speke, Liverpool, for distribution on behalf of the Ministry of Health. The vaccine has to be kept within a temperature range of 2·2° to 2·7° C. and thus arrives in insulated containers as shown in the photographs enclosed. It is then held in the cold chamber until distributed throughout the whole of the country.

The cold chamber consists of an air-raid shelter insulated with polystyrene and working on this cold chamber L. Sterne & Co. Ltd. have fitted a 2 h.p. air-cooled condensing unit with a Searle LT. water defrost cooler. There is a recording thermometer in the chamber, and Gents alarum bells are wired to ring on rise or fall of temperature, outside the required limits.

Engineering Centre in N.Y.—A new United Engineering Centre is to be erected on the United Nations Plaza between 47th and 48th Streets in New York City. The new building will serve as the headquarters of 16 American engineering institutions with a total membership of about 250,000 engineers. The new building will replace the present Engineering Societies Building at 29, West 39th Street, which is now inadequate in view of the tremendous growth of technology since the building was first occupied 50 years ago. Dr. Mervin J. Kelly, president of Bell Telephone Laboratories, is serving as chairman of the industrial campaign to raise funds for the new centre. The present plans call for the occupancy of the building in the autumn of 1960. It will be a 20-storey tower surrounded by lower structures with landscaped grounds. The centre will not only have adequate facilities for present functions, but provision will be made for the continuing growth of the engineering profession. The Engineering Societies' library will be included, and there will also be exhibition space in which the rapid advances in engineering will be interpreted for the general public. An engineering " Hall of Fame " to perpetuate the contributions of distinguished engineers to modern civilization is also under consideration. In all, there will be about 250,000 sq. ft. of floor space. In addition to the five " founder " societies, the American Society of Civil Engineers, the American Institute of Mining, Metallurgical and Petroleum Engineers, the American Society of Mechanical Engineers, the American Institute of Electrical Engineers, and the American Institute of Chemical Engineers, " associate " institutions are being considered for inclusion in the new centre ; among these are American Society of Heating and Air-Conditioning Engineers and the American Society of Refrigerating Engineers.

International News

Canada

The United Kingdom trade commissioner at Edmonton has advised the Board of Trade that owing to a change in the methods for collecting milk from farms by the dairies, an important market for refrigerated storage tanks for milk has developed in the Alberta area. These tanks are required to conform to the standards laid down by the International Association of Milk and Food Sanitarians, Inc., in the U.S.A. A local firm, Bruce Robinson Electric (Edmonton) Ltd., 149 Street and 115 Avenue, Edmonton, is seeking a United Kingdom agency for refrigerated milk storage tanks of this type. A leaflet illustrating the type of cooler required and a copy of the relevant standards laid down by the I.A.M.F.S. are available for inspection in room 620 at the export services branch of the B.o.T. Copies are available for loan in order of receipt of applications. Bruce Robinson Electric (Edmonton) Ltd. are a firm of manufacturers' representatives. They say that they and their associates, Bruce Robinson Electric Ltd., Calgary, are in a position to give a manufacturer complete coverage of the Alberta market. They are considered to be a suitable connexion for United Kingdom firms.

Greece

The total annual market for domestic refrigerators in Greece is valued at some £200,000, about 4,000 units being sold each year. About 90% of these are imported from abroad, the balance being made locally, states the Board of Trade. Absorption type refrigerators are hardly ever used in Greece owing to the climate. Greece's main suppliers of refrigerators are the U.S.A. (General Electric, Philco, Frigidaire, Westinghouse, Kelvinator, Leonard), West Germany (Bosch, Siemens, A.E.G.) and the United Kingdom with a number of well-known makes. Italy also exports some refrigerators to Greece (C.G.E., Indes). Although United Kingdom prices are the highest, as stated earlier in this report, United Kingdom-made refrigerators are popular because of their high quality. While the latest United Kingdom models are very similar in appearance to the American models, which is considered an advantage, the U.S.A. offers comparatively lower prices and enjoys the added advantage that each of their lines is produced in a number of different models (standard, de luxe, fully automatic, etc.). Electric refrigerators are made locally by "IZOLA" and, to a lesser extent, by Petros Filis. The sealed units for these are imported from abroad (mainly from Italy). Latest available figures give the following picture of local production : 1953 : 1,035 units of 6 and 8 c.ft. capacity ; 1954 : 995 units of 6 and 8 c.ft. capacity. In spite of its higher cost, there is a distinct preference for the imported article, and local production is unlikely seriously to threaten imports in the foreseeable future. Considerable pressure is being brought to bear on the Government, however, to render the import of refrigerators as difficult and unprofitable as possible. It is not yet possible to gauge the extent to which such pressure is likely to prove successful, but the Greek authorities have already imposed as many difficulties as possible, such as higher duties and advance deposits, short of actually prohibiting imports of refrigerators.

Jamaica

The United Kingdom trade commissioner at Kingston has reported that Mr. Joseph Binns has informed him that the choice of materials for the new luxury hotel at Montego Bay is now in the hands of Slater and Chait, 244 East 32nd Street, New York City, who, as reported in the previous circular, are the architects for the project, and to whom all materials and enquiries should be sent. In his letter to the trade commissioner Mr. Binns corrected previous information about the project. The hotel site itself is 12 acres and the other land for future development consists of 29 acres. *Then follows in this report one of the choicest snippets that it has been our fun to read. It states :* "*A golf course is, therefore, not contemplated as the site is sheer mountain top and a game played on such terrain could be dangerous. Cricket would also present unusual hazards.*"

Salvador

The British Embassy at San Salvador have informed the Board of Trade that the Salvadorean Social Security Institute intends to construct a hospital which will eventually provide 300 beds and a large out-patient clinic on an extensive site in the "hospital colony" in the suburbs of San Salvador. Salvadorean architects, Messrs. Garcia Prieto and Perla, have been appointed, and it is intended that they should produce preliminary proposals in the near future. The contract for the construction of the buildings will almost certainly go to Salvadorean contractors, but all the equipment will have to be purchased abroad. It is expected that invitations to tender will be issued late in 1958.

Iraq

Tenders for electrical services, air-conditioning and water services and electric lifts for the Commercial Bank of Iraq Ltd.'s new premises in Baghdad have been called for. Documents, on application to the bank and payment of ID. 10,000 in each case, are available from the manager of the Commercial Bank of Iraq Ltd., Baghdad, or from J. Roger Preston & Partners, 15, North Audley Street, London, W.1. The payment is not returnable. Tenders are required to provide a cash or banker's guarantee, as follows : 1—ID. 1,500 ; 2—ID. 2,000 ; 3—ID. 1,000. Tenders must be submitted in sealed envelopes marked "Tender for Electrical Services," "Tender for Air-conditioning and Water Services," or "Tender for Electric Lifts" as the case may be, to the bank manager up to 12 noon, June 30, 1958.

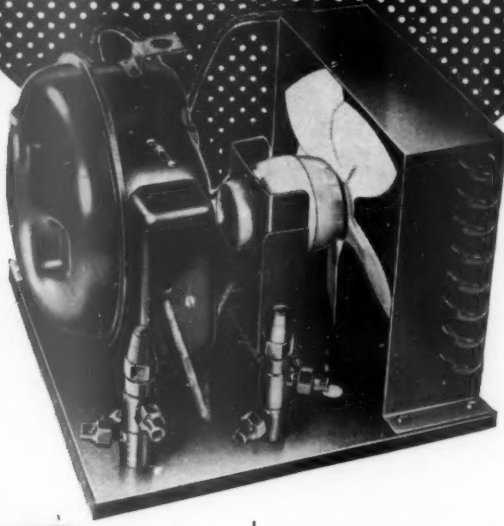
Trinidad

Special register circular COM/12774B of the Board of Trade, dated February 3, 1958, gave information about the new "Hilton" hotel for Port of Spain. The B.o.T. has been informed that the architects are now engaged in preparing the plans of the hotel and it is anticipated that they should be completed in about six months' time. The architects are Messrs. Warner, Burns, Toan, Lunde, 414, Madison Avenue, New York 17, N.Y., who are associated with Messrs. Toro-Ferrer, of Puerto Rico, and Messrs. Watkins & Partners, of Port of Spain.

Burma

It is intended, with the agreement of the Government of the Union of Burma, to hold a British Industrial Fair in Rangoon during the second half of March, 1959. The aim of the fair will be to show how British products can help in fulfilling Burma's national development programme, There will be an exhibit, provided by the Board of Trade, illustrating the United Kingdom atomic energy programme. Other exhibits will be supplied by manufacturers, in most cases through local agents. A local organizing committee, which is being assisted by a member of the fair's branch of the Board of Trade, will be responsible for the selection of

new



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TR55

the exhibits most suited to the national development programme, and will be glad to advise manufacturers on whether their products are likely to be appropriate for that purpose. In view of the general theme of the display it is regretted that certain commodities such as foodstuffs, weapons of war and articles of a kind manufactured locally in cottage industries should be excluded from the fair.

U.S.A.

The British consulate at Miami have informed the Board of Trade that M. Tony Sherman & Associates, 1,101 N.E. 79th Street, Miami, 38, Florida, a firm of architects, are now engaged in drawing plans for hotels in Jamaica, South America and also for a project in the United Kingdom and would be very interested in receiving literature and any other information describing and quoting on United Kingdom merchandise which might be used in such establishments. M. Tony Sherman & Associates serve as architects for a number of hotels, motels and restaurants not only in the U.S. but elsewhere. They are considered to be a suitable connexion for United Kingdom firms. Suppliers interested in this enquiry should write by air mail direct to the Miami concern. *It is important that quotations should show both F.O.B. and C.I.F. prices in U.S. dollars.* It would be appreciated if, at the same time, responding firms would copy their initial correspondence to the British Consulate, 723, Ingraham Building, S.E. Second Avenue, Miami, Florida.

Jordan

The report of a mission organized by the International Bank at the request of the Government of Jordan has been published by the Oxford University Press, London. It is called "The economic development of Jordan," and should be available at leading libraries. Should any United Kingdom firm find difficulty in obtaining access to this report they should communicate with the librarian, Board of Trade, Horse Guards Avenue, London, S.W.1.

Netherlands Antilles

The British vice-consulate at Aruba have reported that the Government of Aruba propose to build a new hotel on the seashore near Palm Beach, Aruba, and the contract has been awarded to The Taylor Construction Company of Miami. The foundations have already been laid and it is stated that construction on the building will start within a few weeks. It is hoped that it will be completed by the end of 1958. A brochure describing the hotel and an artist's impression of the finished building are available for loan from the Board of Trade in order of receipt of applications. Manufacturers interested in offering their goods and services should write direct to the corporation established for the operation of the hotel—N. V. "Aruven," P.O. Box 59, Oranjestad, Aruba, Netherlands Antilles.

Malaya

United Radio Company, of 118/120, Orchard Road, Singapore, 9, have informed the United Kingdom trade commissioner at Singapore that they are interested in obtaining the agency of a United Kingdom manufacturer of domestic refrigerators. United Radio Company are an old established Chinese partnership carrying on the business of exporters, importers and general merchants. They have previously handled radios, refrigerators and electrical appliances on a wholesale and retail distribution basis but now intend to acquire agencies of their own. They can give coverage both in Singapore and the Federation of Malaya. United Radio Company are considered to be a suitable connection for United Kingdom firms. Manufacturers interested in this agency enquiry should write direct to the Singapore concern.

IIR NEWS

with particular reference to the Bulletin of the International Institute of Refrigeration. No. 1, Vol. 38, 1958

By DR. EZER GRIFFITHS, O.B.E., F.R.S., President of the General Conference, I.I.R.

THIS issue of the Bulletin contains the first edition of "Recommendations for an International Testing Code for Refrigerating Machines."

This English version is dedicated to the memory of the late Mr. A. O'B. Brandon, secretary of the Third Commission 1955–7.

In a foreword Professor Glansdorff, president of commission 3, mentions that this document is the outcome of continued collaboration within the commission since the end of the 8th Congress (London, 1951). A special subcommission was set up in 1953 composed of specialists representing machine constructors, users and scientists.

The following countries took part: France, Great Britain, Germany, Italy, Sweden, Norway, Denmark, Spain, Belgium, Switzerland and the Netherlands. Since the Paris Congress (1955) the U.S.S.R. had taken part and the U.S.A. had sent an observer.

The text finally adopted was submitted to the technical board in 1957. Publication was agreed as well as submission to the International Standards Organization with the object of ensuring the compatibility of the document with international standards.

The commission had to decide on the fundamental objective: should the code be a technical document intended only for the use of refrigerating specialists or should it be orientated towards the point of view of users of equipment and thus envisage all the variants of application met with in practice?

Ultimately it was agreed that standardization is best carried out at two levels: (1) International, relating to general definitions and methods of conducting tests (this stage concerns specialists in machines), and (2) National in which the document serves as the basis of a code of practice intended for application by users.

As regards the title of the document, the words "code" or "regulations" imply obligations which cannot yet be foreseen on an international scale. On the other hand, the word "recommendations" reflects more exactly the point of view of the commission, but since in the long run a code is envisaged the final expression "Recommendations for an International Code" has been adopted.

The 19-page document will no doubt receive critical study by refrigerating engineers.

As usual the *Bulletin* supplies news of recent events. Several vice-presidents of commissions have been elected including three from the U.S.A.

The Centro Experimental del Frio (Spain) at its second general meeting in 1957 included in its programme papers on automation, multistage refrigeration, cooling of fresh

water in the manufacture of beer, localization of ammonia leakages in the condensers of a refrigerating plant and control of relative humidity in cold rooms.

The Experimental Institute of State Railways, Rome, has a new installation to measure the overall heat transfer co-efficient through the walls of insulated or refrigerated trucks by using the process of inside cooling of the vehicle.

In the abstracts grouped under the heading " The refrigerating circuit : fluid and media " there is a summary of three lectures by Stoecker, New Zealand, dealing with liquid ammonia recirculation and ammonia liquid return systems.

Another abstract describes the use of direct expansion ammonia in a fully automatic cooling process in a synthetic rubber and plastics plant.

There is an abstract from the technical bulletin of the firm Babcock & Wilcox (France) dealing with an analytical study of evaporative condensers with forced air circulation.

An abstract of a paper published in Switzerland deals with " Economical construction and operation of heat exchangers."

A U.S.S.R. paper is abstracted concerned with the testing of 100,000 Kg. cal./hr. low-temperature absorption refrigerating plant.

It is interesting to note that radioactive isotopes are finding application in the refrigerating industry. The *Bulletin* contains an abstract entitled " The application of radioactive isotopes for the indication of the liquid ammonia level in receivers and other containers."

In the group of abstracts describing developments in cold storage warehouses there is one by M. Foulon entitled " Practical observations about the technical and commercial operation of public refrigerated warehouses."

Air-conditioning is the topic of numerous abstracts and noise control problems receive attention.

Industrial applications of air-conditioning are in connexion with the meat industry, weaving factory, gelatin capsule factory and mining.

The heat pump is a popular topic ; one of the abstracts is entitled " Are heat pumps economical ? "

In the group of abstracts on refrigerated transport reference is made to a handbook published in the U.S.A. on transportation by motor truck.

There is an abstract of a paper on the transport of foodstuffs by air in warm climates which contains useful information on packagings.

The section of the *Bulletin* concerned with chemistry and physics covers a wide field and includes such topics as the study of imperfections of solids by nuclear quadrupolary resonance.

In the section on fruit and vegetables we note that a special issue of *Rev. Frio* was devoted to the refrigeration of stone fruit. Potatoes and their cold storage are the subject of a lengthy paper in *Die Kalte* ; also there is an account of a tour of inspection regarding the rational storage of seed potato.

An extended abstract is given of a paper on " Chilling and freezing of fish."

An abstract of a paper in the *Norwegian Fishing News* deals with freezing in alginate jelly.

As regards regulations and standards we are informed that in the U.S.A. a standard for comfort air-conditioning is proposed to replace the code of minimum requirements for comfort air-conditioning (1938).

We also note that a commission has been set up in Spain to deal with the possible standardization there of refrigerated equipment and plants.

The abstracts mentioned are picked out from the 212 in the *Bulletin*.

THE MARKET IN CEYLON

(*Continued from page* 611)

with standard features (*i.e.* two-speed fan, thermostatic control and humidity control) as shown :—

York Corporation (represented by Colombo Commercial Co. Ltd.) sell window models with water-cooled units as follows : 1 h.p., Rs. 3,600 ; 1½ h.p., Rs. 4,100 ; 2 h.p., Rs. 4,500. Packaged floor models ranging from 3 h.p. to 25 h.p. are available but only 5 h.p. at Rs. 18,000 and 7½ h.p. at Rs. 26,000 are held in stock.

Hotpoint Co. (Ceylon agents United Electricals Ltd.) : 1 h.p., Rs. 3,300 ; 1½ h.p., Rs. 3,700 ; 2 h.p., Rs. 4,200. Packaged units of 5 h.p. are stocked at Rs. 24,250.

Nash Kelvinator (represented by Hirdaramani Ltd.) retail only one window model of 1 h.p. at Rs. 4,500.

Mitchell Manufacturing Co. (agents Siedles Cineradio) market two floor models : 1 h.p., Rs. 3,450, and 1½ h.p., Rs. 3,950.

Amana Refrigeration Inc. (represented by British Electric Co.) sell three window models : 1 h.p., Rs. 3,300 ; 1½ h.p., Rs. 4,000 ; 2 h.p., Rs. 4,700.

Frigidaire, General Motors Corporation (Ceylon agents Rowlands Ltd.) retail two window models : 1 h.p., Rs. 3,500 ; 1½ h.p., Rs. 4,200. A floor model of 2 h.p., with standard features and air cooling, sells at Rs. 7,500. Packaged units range from 3 h.p. to 10 h.p. and the 10-h.p. water-cooled unit is retailed at Rs. 24,500.

Philco International Corporation (represented by Steuart Engineers Ltd.) market only one window model of 1 h.p. at Rs. 3,650.

General Electric Corporation (agents Bousteads (E. & C.) Ceylon Ltd.) stock 1-h.p. window models at Rs. 2,950 and 1½ h.p. at Rs. 3,500.

(*b*) *Central Plant*

Most of the United States manufacturers mentioned above supply also central plant but Carrier Corporation enjoy some 90 per cent. of the business with models ranging up to 40 h.p. One of the two United Kingdom manufacturers represented in this market have recently supplied a 100-h.p. central plant for a commercial bank. There is an acute shortage of skilled technicians capable of assembling and maintaining central plants ; although the available personnel are sufficient for the present any sudden increase in the demand would show up the shortage.

Only three factories in Ceylon are known to be air-conditioned and the prospects for this type of equipment are negligible. Two United Kingdom manufacturers of industrial plant are represented in the market.

How the Business is Done

All the business in domestic air-conditioning equipment is done on a purchasing agency basis. Agents purchase direct from manufacturers at ex-factory prices for resale at their own price. Agents' profit margins appear to be high ; 40 per cent. is the normal return expected, but this is a gross figure out of which allowance must be made for the servicing facilities the manufacturer expects to be offered. Most United States manufacturers guarantee their sealed components for five years and most agents offer free servicing of equipment installed for one year. Agents are normally required to hold a stock of replacement parts ; the usual arrangement is for a fixed proportion of each component to be held against every 10 domestic equipment supplied.

Despite the virtual United States monopoly of the Ceylon market, there are bright prospects for United Kingdom manufacturers of domestic air-conditioning equipment. There is no shortage of agents anxious and waiting for a British-made model but it must, of course, be at least comparable to the standard efficiency set by the American equipment.